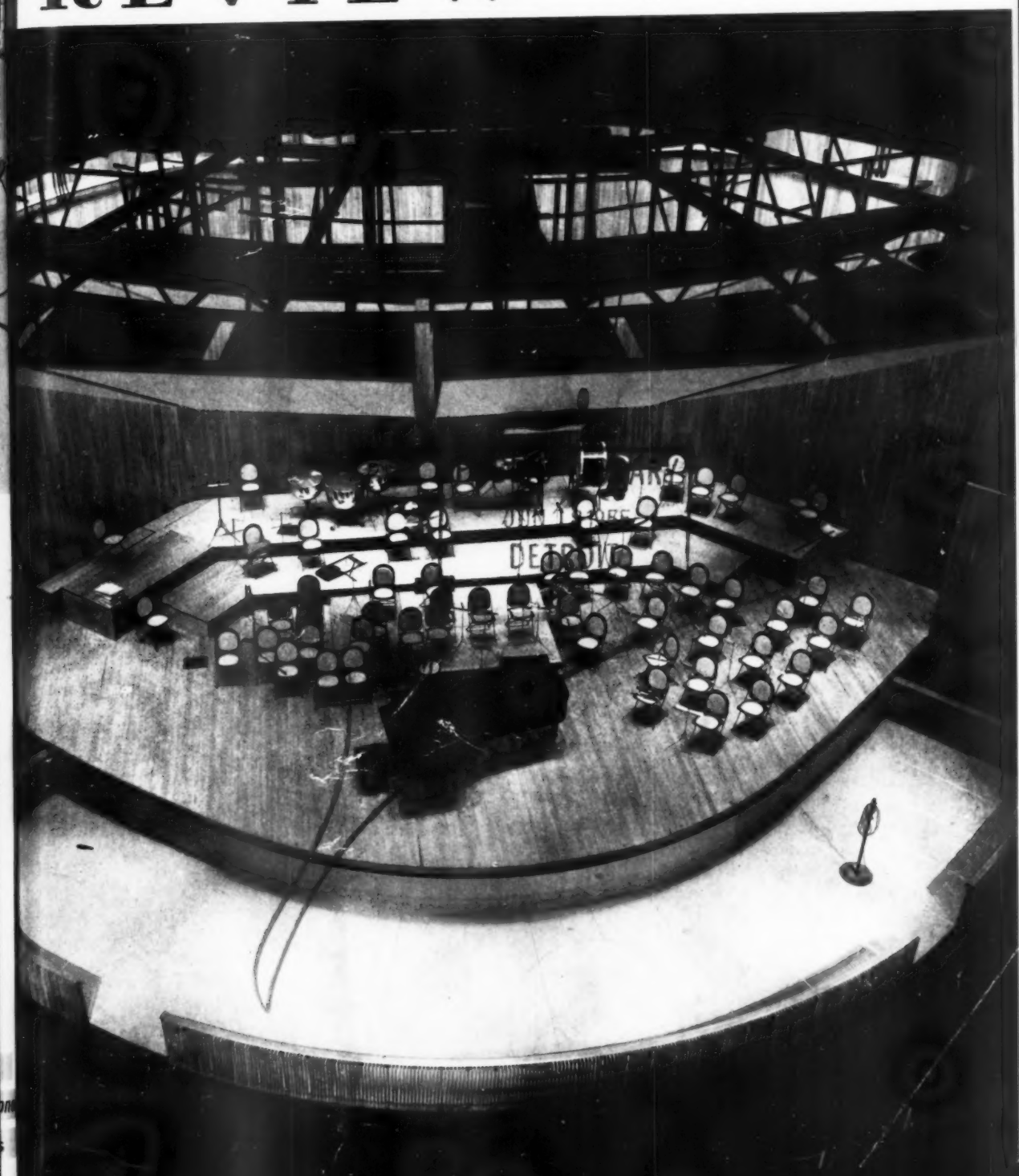
TECHNOLOGY REVIEW

June 1955



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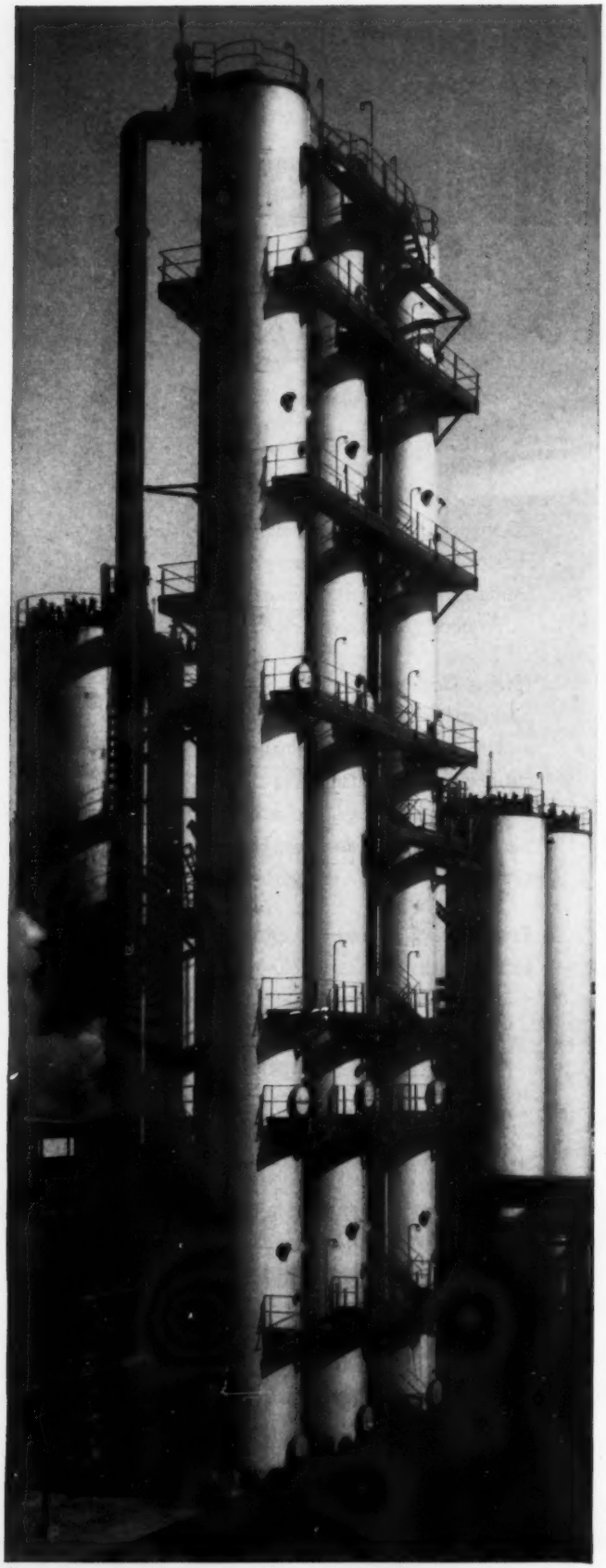

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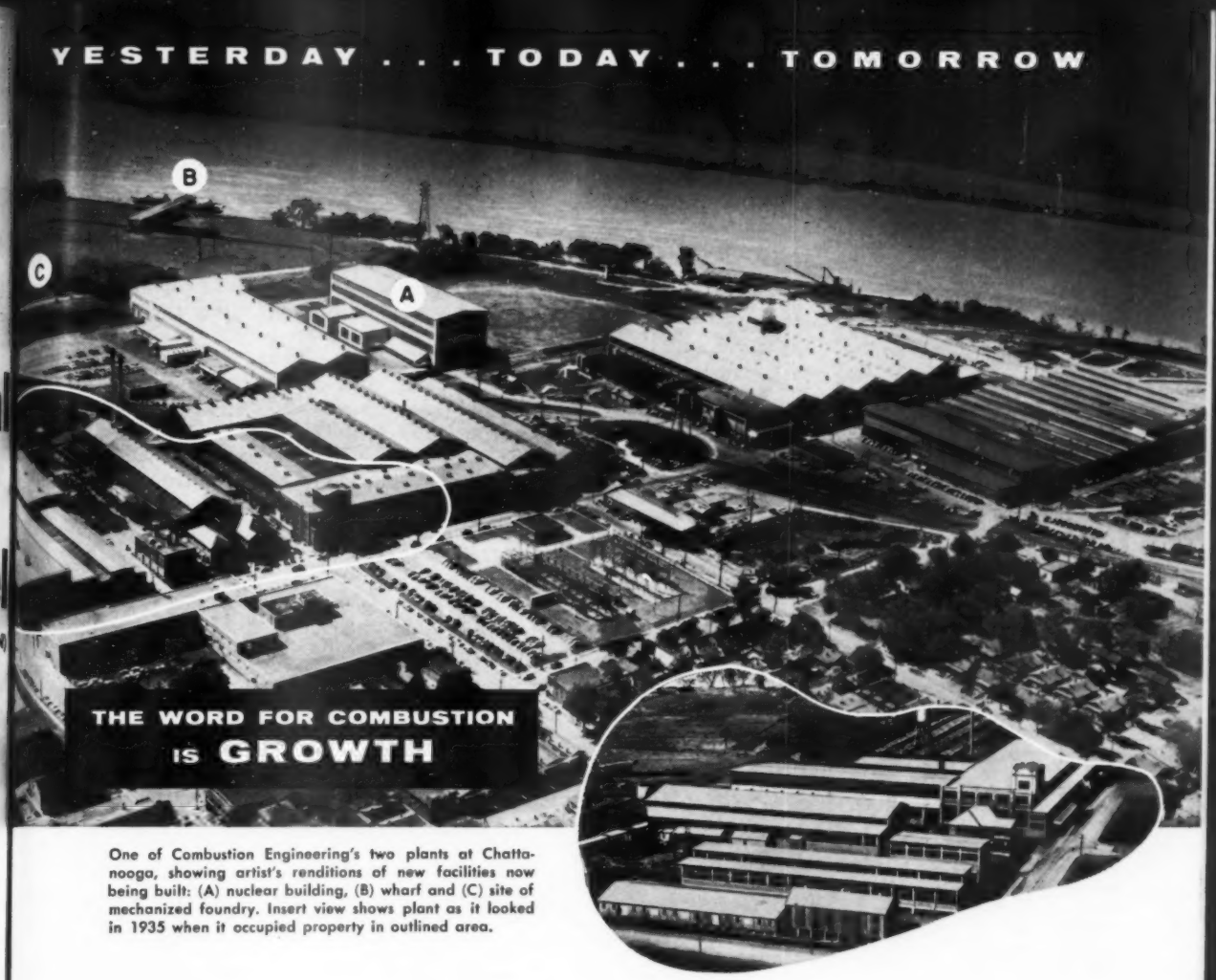

One of Combustion Engineering's two plants at Chattanooga, showing artist's renditions of new facilities now being built: (A) nuclear building, (B) wharf and (C) site of mechanized foundry. Insert view shows plant as it looked in 1935 when it occupied property in outlined area.

• In little more than three years, Combustion Engineering has doubled the capacity of this plant, one of its five domestic manufacturing divisions. And the growth continues, high-lighted by new multimillion-dollar facilities to increase both production capacity and product diversity.

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THE TABULAR VIEW

Acceptance. – In dedication ceremonies at the Kresge Auditorium on May 8, PRESIDENT KILLIAN accepted the new auditorium and chapel on behalf of the Institute, and indicated the part these two new buildings are expected to play in the Institute's broad educational objective. The Review is pleased to bring to its readers this acceptance address (page 401) which includes some notes on the educational and spiritual objectives M.I.T. seeks to fill through the use of these structures. President Killian also introduced Sebastian S. Kresge of the Kresge Foundation, whose extemporaneous and informal remarks are mentioned (page 385) in The Review's running account of the dedication program and Fortnight Festival.

Dedication. – Principal speaker at the dedication of the new campus center at M.I.T. on May 8 was HIS EXCELLENCY E. N. VAN KLEFFENS, currently the Netherlands Minister to Portugal. Technological studies, Dr. van Kleffens held, can provide the environment for deepening our sense of spiritual values, provided they are intelligently directed. This scholarly dedicatory address appears in full on page 403 of this issue. Soon after taking his doctor of laws degree at Leyden University in 1918, Dr. van Kleffens began his diplomatic career. After two years in the Secretariat of the League of Nations, he entered the Netherlands foreign office, and, just before the outbreak of World War II, he was appointed foreign minister. He is a former ambassador to Washington. During the war he wrote *Juggernaut Over Holland* which, throughout 46 secret editions, gave moral support to the Dutch people. His connection with the United Nations dates from its earliest days, and last year he was president of the U. N. General Assembly. He is also minister of state – one of the highest offices the Netherlands can bestow. In this lifetime post, he serves as adviser to the throne.

Affirmation. – As part of the exercises in which the Institute's new auditorium and chapel were dedicated, the REVEREND THEODORE P. FERRIS gave the address of affirmation. Dr. Ferris took occasion to review the relationships between science and morality, and pointed out that the more power science places in the hands of man, the more he needs a sense of moral value to guide him in the use of that power. The Review is happy to bring to its readers (page 406) the text of this stimulating address. Dr. Ferris received the A.B. degree from Harvard University in 1929, the B.D. degree from General Theological Seminary in 1933, and the D.D. degree from Rollins College in 1944. He was ordained as deacon in 1933 and as priest in 1934. From 1933 to 1937 he was assistant at Grace Church, New York, and between 1937 and 1942 he was rector of Emmanuel Church in Baltimore. He is now rector of Trinity Church in Boston, and a special term member of the M.I.T. Corporation.

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MAIL RETURNS

Controversy on the Great Conversation

The publication of George Tichenor's "Interrupting the Great Conversation" in the March, 1955, Review brought a welcome windfall of readers' comments to the editor's desk. In fact, the response to this article has been the means of reminding the editor that the reader audience of The Review continues to be an alive and stimulating one. Here are some of the comments to be shared.—Ed.

FROM J. TERRY SMITH, '33:

The article raised the problem with surpassing skill but sloughed off the solution without much application of that remarkable phenomenon, the scientific method. Such an end result might have been expected from one so trained as the author in the "liberal arts." If the true facts were elicited from some of the hundreds of thousands of engineering graduates of the past 20 years, the solution of today's dearth of not-yet-dry-behind-the-ears "engineers" would be obvious.

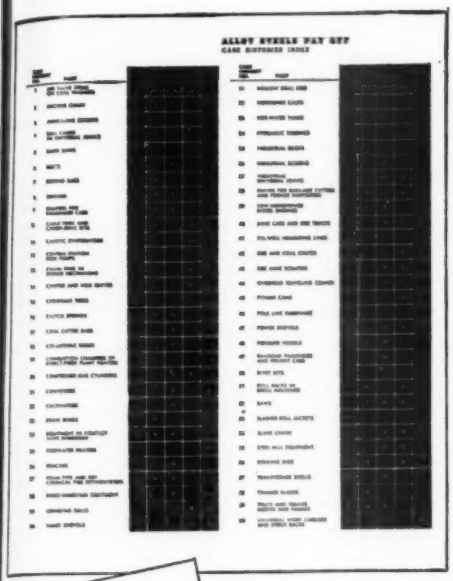
The country is full of men who received an engineering education back in the good old days when the term humanities had not been invented. However, quite a large portion of them have found that the pay scales for their talent as engineers are considerably lower than they had been led to expect before the 1929 crash in the stock market.

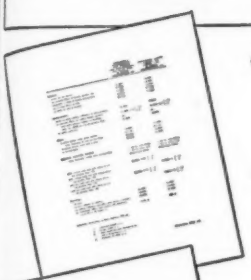
Large-scale industry pays only for what it needs. It needs labor—skilled, semiskilled, and unskilled—and pays quite well for it. It needs salesmen to dispose of its product and pays very well for them. It needs a wide market to allow it to increase the quantity of its production and hence pays fantastically high prices for advertising. But does it need engineers to design its product and the tools to make it? Not altogether as much as one would think. Hence the role of engineers in industry is the minor one of refining a line here or making a closer tolerance there, or maybe giving the scrap heap a long close look to try to avoid so much waste and hence reduce the cost of the product. No new inventions sprout in such an atmosphere. Any respectable junkman can spot waste. Any good maintenance man can find weak spots in either the product or the tools that make it. Finally, when we examine the backgrounds of the men who manage the typical large business we find that they are not interested in science or engineering, as such, but only to the extent that such knowledge may enhance their profit and loss sheet.

Today the government is the largest employer of engineering and scientific skills. The pay is abominably low. Small wonder that Junior has no desire to be an engineer like Daddy. Junior can make more money as a craftsman and he doesn't have to go to college either.

True, there are various so-called engineering schools which have to teach high school algebra to their freshmen so that they can understand the next year's course in high school physics and finally be induced to take a course in high school chemistry. These are probably included in the total of 20,000 graduates mentioned in the article. Unfortunately, very few engineering schools have as high standards as M.I.T. As an operator in a big business I come in contact with numerous of the breed and witness some fantastic concepts which the "engineers" try to put over. . . . Thus is the vicious circle completed. Poor engineering education leads to poor job with poor

(*Continued on page 380*)





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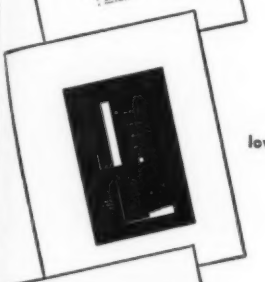
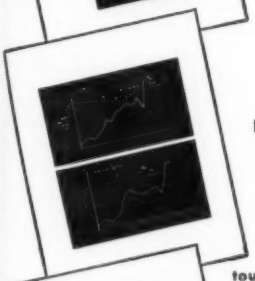


Facts on lower operating costs



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MAIL RETURNS

(*Continued from page 378*)

pay in company where the salesmen do the designing and the engineers are glorified draftsmen.

Only way out, both for the engineer and the country is to apply the law of supply and demand. This is being done, both by the companies who feel keenly the loss of good engineering talent and by the men who forsake engineering for another line of endeavor. Why the author of the article should wring his hands in woe over the fate of his precious skin at the hands of the Russian engineers is something I cannot fathom. Where was he in 1933, when engineers were a dime a dozen and no takers? Is all he has to offer a mild form of imitation of the Russians' statism?

The knowledge we need to beat the Russians is not something we learn in school out of books but something we should have learned at our Mother's knee. Worrying about how to fight the war of the future will only get you ulcers. It is not possible to negotiate a peace when the adversaries are thieves and murderers. The only thing left to do is to fight the war now, with the weapons at our command, on the ground of our own choosing. When dealing with honorable men, honor can be used, but when the converse is true how can we shrink from the task and wail "peace at any price"?

Aruba, Netherlands Antilles

FROM ALBERT S. KNIGHT, JR., '42:

I was very much impressed by the fact that the country needs more scientists and engineers. Being a graduate engineer from M.I.T., I feel that young people today should be encouraged to pursue a technical career. . . .

The article stressed the fact that the Soviet Union is turning out scientists and engineers two or more to our one. In face of that, why not use what we have in the country now to fill the vacant spots in industry? Survey the industries. Maybe there are good engineers now working as stock clerks, for example. If so, let's get them into engineering!

Rochester 10, N. Y.

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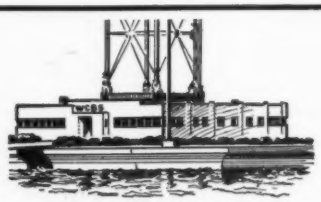

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VOL. 57, NO. 8 **JUNE, 1955**

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M.I.T. Photo

"God also plays upon this string first, when he sets the soul in tune for himself."

***The Shepherd Boy's Song* — John Bunyan**

With the opening of the Institute's chapel, interior of which is shown above, opportunity for meditation and worship in the manner of their choice is afforded to Technology students and Faculty members.

THE

TECHNOLOGY REVIEW

Vol. 57, No. 8 June, 1955

The Trend of Affairs

Dedicate Kresge Auditorium and Chapel

PROBABLY no event in the current school year at M.I.T. is more indicative of, or more in keeping with, the trend of affairs than the two-week (April 30–May 14) festive events that reached a peak on May 8 when the Kresge Auditorium and Chapel were dedicated. The 1,200 persons who attended the two-hour dedicatory ceremony heard James R. Killian, Jr., '26, President, accept the two splendid structures on behalf of the Institute; reflected upon the address of affirmation by the Reverend Theodore P. Ferris, Rector of Trinity Church, Boston, representing the M.I.T. Corporation; listened to a scholarly dedicatory address by His Excellency E. N. van Kleffens, Minister of State, the Netherlands Minister to Portugal; and received inspiration from Rabbi Herman Pollack and Father Edward J. Nugent, both of whom are among the group of spiritual advisers to Technology students.

In addition, the audience was treated to the premier performance of "Canticle of Freedom" by Aaron Copland, and it heard the M.I.T. Choral Society, Glee Club, Symphony Orchestra, and Brass Choir in an unusual program of modern music which, nevertheless, had deep roots in past centuries. With the exception of the Copland composition, commissioned for the occasion by M.I.T., all portions of the dedicatory program mentioned above were conducted in the traditional manner, according to the program given in the box on page 386.

Sebastian S. Kresge, founder of the Kresge Foundation and principal benefactor of the two buildings around which the Institute's future social, cultural, and religious life will center, completely captured the audience with his informal and unprepared remarks.

Stressing the need to develop the virtues of independence and thrift, coupled with hard, honest toil, Mr. Kresge spoke of his ancestors and his early life on the family farm in the Pocono Mountains of Pennsylvania where members of his family still live. Unconsciously emphasizing the vast changes which have taken place in our moral attitudes, family life, and economic philosophy since his birth 88 years ago, Mr. Kresge recalled that, at the age of 19, he taught a country school for a wage of $22 per month. He emphasized the magnitude of his salary by stating: "I mean $22 per month, not $22 per week, $22 per day, or $22 per hour." The money he earned went to his parents until he was 21 years of age. For the next decade, Mr. Kresge was employed as a salesman, but the urge to grow and to develop, along with the youthful United States, was strong, and in 1897 he took over half interest in a store in Memphis, Tenn. Smiling, as he leaned over the lectern in the new auditorium he had given to Technology, Mr. Kresge said:

"I'm going into this foolish talk to show you how someone can get along if we just economize and work – and do a lot of other things too, of course. I worked; I didn't work only eight hours, but sometimes 18 hours a day."

Suddenly he stopped talking about his youth and became occupied with the event that was the occasion for his visit to the Technology campus. He reported that he had not seen the buildings named after him until the very day of the dedication. In midmorning on Sunday, May 8, Mr. Kresge was conducted through the new buildings and had his first opportunity to meet members of the Institute's Faculty and Administration. A few hours later, as he spoke at the dedication, he was able to report that M.I.T. "officials look like good citizens. I wish them success in making better citizens for our nation and the world through these two buildings of my little instrumentality."

M.I.T. Photos

Sebastian S. Kresge delivers to President Killian a charter symbolizing presentation to the Institute of the new auditorium and chapel. The scroll, which Mr. Kresge holds, gives embodiment to the Institute's responsibility "to maintain an atmosphere of religious freedom wherein students may deepen their understanding of their own spiritual heritage, freely pursue their own religious interests, and worship God in their own way."

Exercises of Dedication

Fanfare	by Dietrich Buxtehude, 1629
Processional	by Johann Pezel, 1681 The M.I.T. Brass Choir, John Corley, Director
Invocation	Rabbi Herman Pollack Adviser to the Hillel Foundation at M.I.T.
Overture	"Canticle of Freedom" by Aaron Copland, for orchestra and mixed chorus. Text from *The Brus*, by John Barbour, 1375. This is the first performance of the work, which was commissioned for this occasion. The M.I.T. Symphony Orchestra, Glee Club, and Choral Society, Professor Klaus Liepmann, Director.
Presentation of the Auditorium and Chapel	Sebastian S. Kresge The Kresge Foundation
Acceptance	Dr. James R. Killian, Jr., President, The Massachusetts Institute of Technology
Affirmation	The Reverend Theodore P. Ferris, Rector of Trinity Church, Boston, representing the Corporation of M.I.T.
Hymn	"Now Let Every Tongue Adore Thee" The audience with the Chorus, the Brass Choir, and the Orchestra.
Dedicatory Address	His Excellency Dr. E. N. van Kleffens, Minister of State, The Netherlands Minister to Portugal, President of the Ninth Session of the General Assembly of the United Nations.
Cantata No. 50	by Johann Sebastian Bach, "Now Shall the grace . . ." The M.I.T. Choral Society, Glee Club, and Symphony Orchestra
Benediction	Father Edward J. Nugent Chaplain to the Technology Catholic Club
Fanfare	by Ernst Levy, 1947
Recessional	by Earl Zindars, 1952 The M.I.T. Brass Choir

Thus, in simple, sincere words did Mr. Kresge strike the keynote of the dedication. His remarks were extemporaneous in the sense that he did not employ a prepared address or speak from notes. But no one could miss the fact that his simple direct remarks reflected almost nine decades of preparation through a life in which moral strength had been constantly enriched, not alone by early training, but by righteous living. All who heard him subconsciously recognized that Mr. Kresge had learned well his lessons to fear God, to help his fellow man, to work hard, and to save a portion of the products of his toil. These are the fundamental virtues to which the new buildings are dedicated, and a more effective expression of this aim could hardly have been made. Mr. Kresge's comments carried the force of conviction through directness and simplicity; he was not acting, but in Thespian parlance, "he brought down the house."

As if to recognize and emphasize the new era ushered in by dedication of the new buildings, the New England weather cleared up at noon on Sunday, May 8, after a fortnight of almost unbroken rainy weather. The transition could be regarded as symbolic that a long period of activity and preparation were about to initiate Technology's new venture into those phases of life in which the integral sign, slide rule, and test tube play a role completely subordinate to the lyre, the scroll, and the altar.

For considerably more than a year, the Institute's West Campus has been the scene of intense activity as ground was broken, forms were erected, steel reinforcement was set in place, and concrete was poured for what are – by all odds – the most unusual buildings to be erected on a new plaza and cultural center at M.I.T. The new structures are sufficiently different from anything that has thus far

been built on American college campuses as to elicit the editorial comment in *Architectural Record* that: "American architecture and building are not likely to be quite the same after M.I.T.'s new center is finished." Whether this prophecy will prove to be true or not, certainly the *Record's* comment is indicative of the kind of interest aroused in the architectural profession by the new auditorium and chapel designed by Eero Saarinen and Associates.

Many new and unusual features are incorporated in the two new buildings whose conception itself brings new meaning to the architect's phrase that "form follows function." Pertinent thoughts underlying the architectural philosophy which guided the design of the auditorium and the chapel are stated for The Review in the following words from Eero Saarinen:

Now that the auditorium and chapel have been dedicated, it seems interesting to look back at the concepts which lay behind their design.

First, the auditorium. I have been asked why the auditorium did not have the so-called "perfect acoustical shape" which I had used in auditoriums before. Acoustics seem to me – and I think our acoustical engineers, Bolt, Beranek and Newman, would agree – a modifying factor. It is a most important modifying factor, but not a science with the authority to impose a basic shape on an auditorium. The structure, involving the spanning of a great space, has more authority in terms of design and the determination of a basic form. Moreover, a basic form can be expressive of a larger purpose than the mechanical one and may also be a form that has a meaningful relation to its site and its neighbors.

A dome seemed right for the M.I.T. auditorium for many reasons: (1) That shape is a recurrent motif of the existing M.I.T. campus; (2) It gives expression to the idea of sheltering a large space – a single room – in which many people can congregate; (3) It provides a pleasant interior space for an auditorium where the audience and the stage can be in intimate relation to each other (which was especially important at M.I.T.); (4) The strongest, most economical way of covering an area with concrete is with a dome and a dome of thin-shell concrete seemed right for a university interested in progressive technology; (5) It was possible to confine the acoustical "floating clouds" only to certain areas, so that the sweep of the dome could be comprehended and enjoyed from the interior as well as the exterior.

As there are many ways of doing equally workable things, we made dozens of models. The three-pointed dome, allowing a fan-shaped plan, seemed right in terms of the auditorium requirements. A low dome, coming down to three points on the ground and set, with the chapel, in its own plaza, seemed to be in an appropriate relationship to the multi-story, squarish blocks and high domes around it.

Then, the chapel. There were also a variety of reasons to support the concept of a windowless cylinder for the chapel. This shape implied the self-contained, inward-feeling which was desirable for a chapel of this kind. The undulating walls on the interior were not only necessary for acoustical reasons but would also emphasize the enclosed feeling and add enrichment. The atmosphere of spiritual unworldliness would also be conveyed by the

Portions of the academic procession when the Kresge Auditorium and Chapel were dedicated on May 8.

Representatives of the M.I.T. student body (right) *took part in the dedication ceremonies, along with members of the Faculty, the M.I.T. Corporation, and honored guests* (above). *Both groups are shown entering the foyer of the auditorium on their way to the main hall.*

Fortnight Festival Program

Saturday, April 30
8:30 P.M. *in the Auditorium*
Concert: Mount Holyoke College Glee Club, Professor Ruth Douglass, Director; M.I.T. Glee Club and M.I.T. Symphony Orchestra, Professor Klaus Liepmann, Director.

Monday, May 2
8:30 P.M. *in the Auditorium*
Concert: Haydn's "Creation," M.I.T. Choral Society and members of the Boston Symphony Orchestra with Helen Boatwright, Donald Sullivan, and Paul Matthen, Soloists; directed by Professor Klaus Liepmann.

Tuesday, May 3
8:30 P.M. *in the Little Theater*
Dramashop: "The King and the Duke," Francis Fergusson's adaptation of Mark Twain's Huckleberry Finn, *directed by Professor Joseph D. Everingham. Incidental music conducted by the composer, Professor Gregory Tucker. Choreography by Nora White Shattuck.*

Wednesday, May 4
5:00 P.M. *in the Little Theater*
Discussion: Representatives of Harvard Debating Society and M.I.T. Debating Society: "The Technical and the Liberal Arts Education."
8:30 P.M. *in the Little Theater*
Dramashop: "The King and the Duke."

Thursday, May 5
8:30 P.M. *in the Little Theater*
Dramashop: "The King and the Duke."

Friday, May 6
8:30 P.M. *in the Little Theater*
Dramashop: "The King and the Duke."

Sunday, May 8
3:30 P.M. *in the Auditorium*
Exercises of Dedication of The Kresge Auditorium and The M.I.T. Chapel.

Monday, May 9
8:30 P.M. *in the Auditorium*
Exhibition of swordplay by Joseph L. Levis '26, former United States Olympic Foils Captain and the present United States National Foils Champion; Silvio Vitale, Fencing Master; Edward Somody, Varsity Captain; Harold Miller and other members of the M.I.T. Fencing Group; and guests.

Tuesday, May 10
8:30 P.M. *in the Little Theater*
The Staff Players: "The Skin of Our Teeth," by Thornton Wilder, directed by Dr. Preston K. Munter.

Wednesday, May 11
8:30 P.M. *in the Auditorium*
Open meeting of the American Academy of Arts and Sciences: Lionel Trilling, Professor of English, Columbia University. "Sigmund Freud and the Crisis in our Culture."
8:30 P.M. *in the Little Theater*
The Staff Players: "The Skin of Our Teeth."

Thursday, May 12
8:30 P.M. *in the Little Theater*
The Staff Players: "The Skin of Our Teeth."

Friday, May 13
8:30 P.M. *in the Auditorium*
Concert: The M.I.T. Concert Band, John Corley, Director.
8:30 P.M. *in the Little Theater*
The Staff Players: "The Skin of Our Teeth."

Saturday, May 14
8:30 P.M. *in the Little Theater*
The Staff Players: "The Skin of Our Teeth."

light: by setting the chapel on arches, formed where the inner and outer walls meet, and placing these in a water-filled moat we could get a soft, mysterious secondary light which would be a foil to the light coming from directly above the altar. A bell-tower seemed the appropriate crown to such a building and we look forward to seeing this element installed this summer.

In thinking of the two buildings in relation to each other, we felt these two shapes were good together, in that they were at once both in opposition and in harmony. The dark brick of the chapel, in turn, is in contrast with the auditorium but blends with the surrounding buildings. We tried to plan the auditorium and the chapel so that they would have a good relationship to each other in the plaza, but also so that the relationship would work were the projected Student Union building to be built to complete the square.

At the completion of any job, the client and the architect have lived long enough together so that the client has pretty definite ideas about the architect. So does the architect about the client. Both Bruce Adams, who was in charge of the work, and I can think of no better client for this job which was a wonderful and interesting challenge.

The Review is happy to be able to present a description of the new buildings and plaza center (page 391) which has been reviewed, in manuscript form, by representatives of those who had most to do with the design and construction of the auditorium and chapel.

Fortnight Festival

As the new Kresge Auditorium and Chapel neared completion, a great surge of activity was planned to coincide with the dedication ceremonies. In fact, a Fortnight Festival of music, drama, lectures, symposia, swordplay, and other events were staged in the auditorium in a pageant intended to emphasize the role of the new structures in the academic life of M.I.T. students and Faculty members. The program of events, which began on April 30 and continued through May 14, is given in the opposite column.

In announcing the Fortnight Festival, John E. Burchard, '23, Dean of the School of Humanities and Social Studies, and chairman of the Festival Committee, said:

"It is appropriate that part of our dedicatory exercises for the new auditorium and chapel sound a note of joy for the new opportunities the versatile Kresge Auditorium offers to our many and varied activities in music and the theater. It is appropriate also that this joy should be expressed in the spring, and that it should be marked by a Fortnight Festival in which many of our student groups will be able to demonstrate the quality of their activities in a new and compatible environment."

The excellent acoustic properties of the auditorium were put to their first public test on the evening of April 30 when the Mount Holyoke College Glee Club joined the M.I.T. Symphony Orchestra and the Glee Club in offering a concert that was well attended by the student body. The musical event was under the direction of Professor Ruth Douglass, Director of the Mount Holyoke Glee Club, and Professor Klaus Liepmann, M.I.T. Director of Music. Two days later, on May 2, Haydn's "Creation" was given in the auditorium by the M.I.T. Choral Society and members of the Boston Symphony Orchestra.

Soloists were Helen Boatwright, Donald Sullivan, and Paul Matthen. Miss Boatwright has been soloist with both the Collegium Musicum and the Society for Early Music in Cambridge, and has participated in Bach celebrations in various parts of the country. Donald Sullivan is tenor soloist at Temple Israel in Boston and in Union Church in Waban. He has had concert and operatic appearances in Boston, New York, Philadelphia, and Washington. Paul Matthen is a foremost interpreter of German lieder, and has been soloist with the Boston, Philadelphia, and Baltimore symphonies as well as with the Robert Shaw Chorale, the Dessoff Choirs, and the Cantata Singers.

Francis Fergusson's play, "The King and the Duke," was given in the Little Theater, on the lower level of the auditorium, for four evenings, beginning on May 3. The experimental play, which is based on Mark Twain's classic "Huckleberry Finn," was performed by the M.I.T. Dramashop. Thornton Wilder's Pulitzer Prize play, "The Skin of Our Teeth," was given by the M.I.T. Staff Players, May 10–14.

Representatives of the Harvard Debating Society and the M.I.T. Debating Society discussed "The Technical and the Liberal Arts Education" in the Little Theater on May 4.

Champion swordsmen participated on May 9 in an exhibition of swordplay that included bouts, demonstrations, and novelty contests. Theatrical dueling scenes from *Cyrano de Bergerac* were presented in modern dress by members of the M.I.T. Fencing Team. M.I.T. students also participated in a tallyho contest, with the participants fencing on roller skates while carrying balloon targets.

Joseph L. Levis, '26, former Olympic foils captain and current United States national foils champion, Silvio Vitale, M.I.T. fencing master and former Italian intercollegate champion, and Ray Chambers, current Midwest three-weapon champion, who served as master of ceremonies, took leading roles in this unusual event in the main auditorium.

Lionel Trilling, Professor of English at Columbia University, and one of America's leading cultural historians, spoke at a joint meeting of the American Academy of Arts and Sciences and students of M.I.T. on May 11. His topic was "Sigmund Freud and the Crisis in Our Culture."

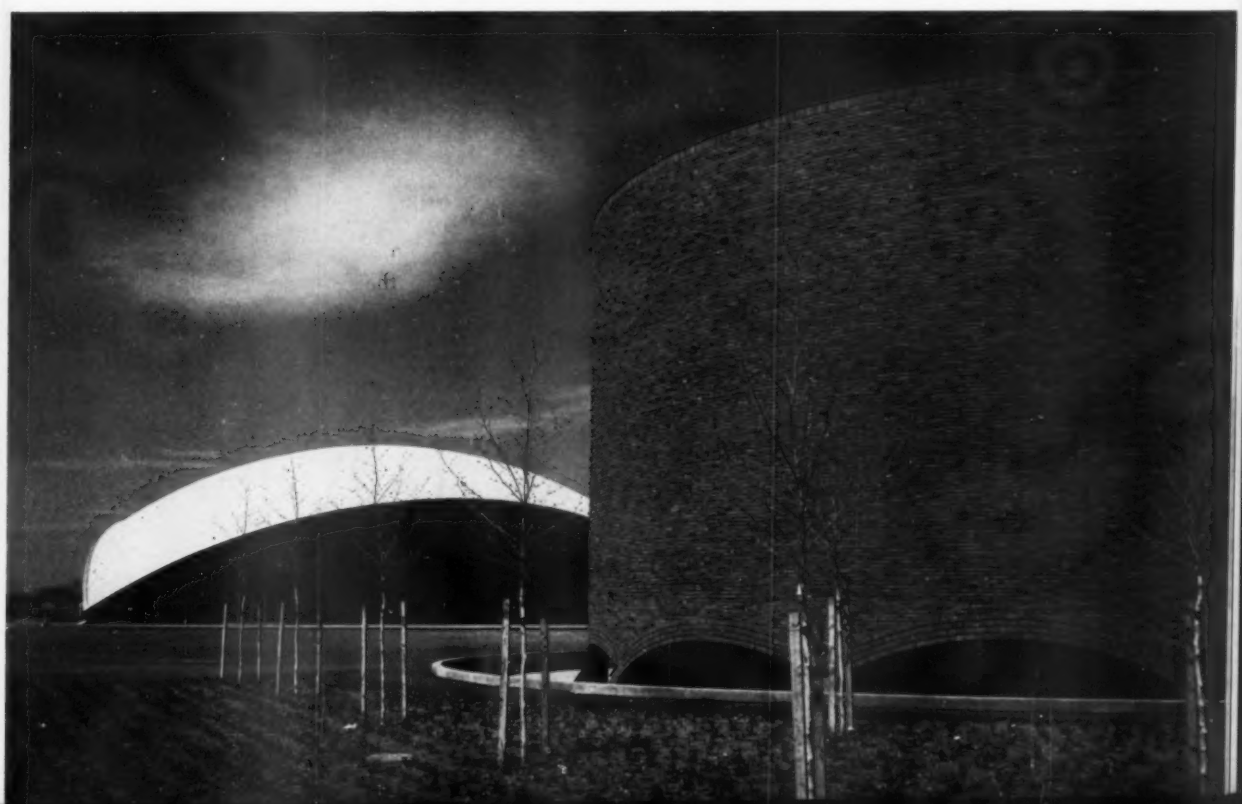
In his address Professor Trilling declared that the defenselessness of the average American against the demands of American culture is becoming a "cause for alarm. We must recognize how open and available to the general culture the individual has become . . ." said Professor Trilling . . . "how unified and demanding the culture has become. . . . We really cannot imagine what it means to take an intellectual chance, or to make an intellectual mistake, or to have a real intellectual difference."

Speaking of current theories of education, Professor Trilling said:

"We come more and more to believe that the elaborate ideology of 'integration with the group,' of 'cooperation,' of 'whole development,' of 'social studies and communication arts' is in effect the highly intellectualized rationalization of some deep anti-intellectualism. . . .

"We know that the intention of this pedagogy is to foster equality and democracy and good will, but

Kresge Auditorium (background) and the Chapel, showing moat and arches.



we begin to perceive that it is hostile to distinction, and to mind, and to accuracy of thought, and at a moment in our history when distinction, and mind, and accuracy of thought were never more needed."

On May 13 the M.I.T. Concert Band, which specializes in original band music, concluded the musical program of the festival under the direction of John Corley. A feature of the program was the premier performance of "Suite for Band" by Ernst Levy, Visiting Professor of Music at M.I.T. Paul Hindemith's "Symphony for Band" was also played for the first time in Boston. While the 70-piece band played on the main stage, the M.I.T. Staff Players gave a performance of "The Skin of Our Teeth" in the Little Theater, directly below.

The double performance provided a good test of the acoustic isolation of the two halls. In the Kresge Auditorium, the main stage is floated on a spongy cushion of fiber glass and the ceiling is suspended from the dome by rubber mounts. Other features which help achieve acoustic isolation and determine the acoustic properties of the auditorium are discussed on page 397.

The first religious service in the new cylindrical chapel was held on the afternoon of May 13 under the auspices of the United Christian Council, made up of representatives from Protestant and Orthodox groups in the M.I.T. community. Regular services of worship are planned for next fall by the United Christian Council, as well as Roman Catholic and Jewish groups on the M.I.T. campus.

The events for the Fortnight Festival provided ample opportunity for all to enjoy the facilities which the new auditorium, and the Little Theater, on the lower level, now make available to "the Tech family," for not all of the Institute's community of some 12,000 persons could hope to take part in the dedication ceremonies where seats for but 1,200 were available.

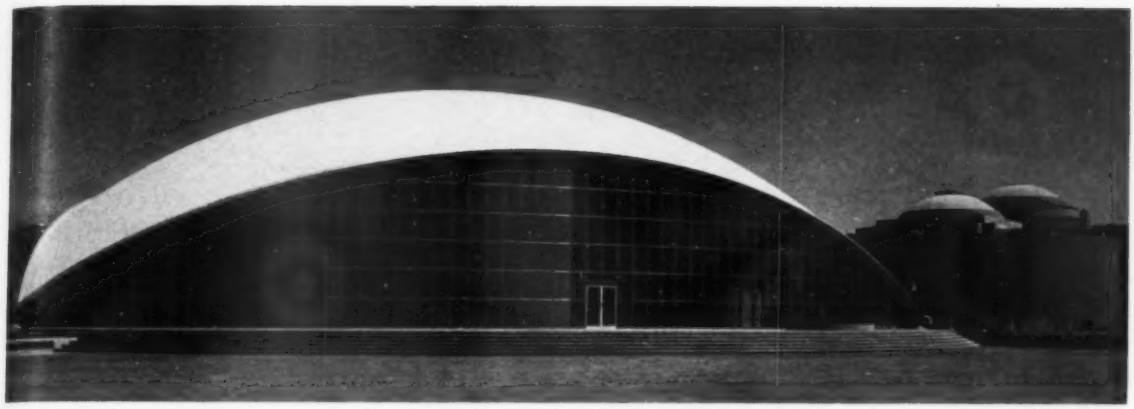
Dedication Ceremony

Promptly at 3:30 on May 8, as the M.I.T. Brass Choir struck up the processional march, several hundred members of the Institute's student body filed through the side aisles and into their seats in the center of the auditorium. They were followed by representatives of the Institute's Faculty from each Department, members of the M.I.T. Corporation, and honored guests. At 94 and 88 years of age, respectively, Godfrey L. Cabot, '81, and Sebastian S. Kresge were the oldest of the honored guests, and had places well in the lead of the procession. Other honored guests included: Howard C. Baldwin, Marshall B. Dalton, '15, Dr. Ferris, Amos F. Gregory, the Reverend Robert C. Holtzapple, President Killian, Stanley S. Kresge, the Very Reverend Monsignor Francis J. Lally, Eero Saarinen, Dr. Van Kleffens, and Rabbi Maurice L. Zigmond. The Faculty Marshals were Professors John T. Rule, '21, and Maurice E. Shank, '49. John S. Saloma, 3d, '56, and Alexander L. Pugh, 3d, graduate student, were Student Marshals.

After the procession, the invocation was given by Rabbi Herman Pollack, adviser to the Hillel Foundation at M.I.T.

(*Continued on page 426*)

Interior of Kresge Auditorium, as seen from the choir loft.



M.I.T. Photos

The concrete shell of the new auditorium now adds a third element to carry out the dome motif at the Institute.

Structures — Spherical and Cylindrical

Auditorium and Chapel of Unusual Architecture Expand M.I.T.'s Cultural and Religious Program

By THE TECHNOLOGY REVIEW STAFF

In the olden days, "When M.I.T. Was 'Boston Tech,'" the Institute was known almost exclusively as an outstanding engineering school. Its students were engrossed so completely in technical studies of such intensity as to warrant the statement: M.I.T. is a place for men to work, not for boys to play. Although not always so recognized — even by Technology Alumni — the present M.I.T. is vastly different from what it was a quarter of a century ago, or even a decade past. Today, M.I.T. places substantial emphasis on the "humanities" and science, as well as upon engineering. In the words of President Killian, "It is a university polarized around science" and aims to "educate the whole man." This newer philosophy is reflected in the Institute's ever-changing campus which now has facilities for housing any and all students who prefer to live in dormitories or fraternities in close proximity to the Institute.

The changing emphasis in M.I.T. education is reflected in the changing growth of its campus. As already reported in The Review on several occasions, the present tendency is to devote the space east of Massachusetts Avenue to academic buildings and laboratories. In the Institute's long-range planning, the area west of Massachusetts Avenue has been set aside for buildings devoted primarily to housing and recreational activities.

Great plans are ahead for M.I.T. construction in the future. Although at present some of these plans are simply ideals to be worked for, they do, nevertheless, represent a definite aim which guides present construction activities.

Long considered, for example is a plan for depressing Massachusetts Avenue so that traffic will flow in an underpass about 15 feet below the present street level. When these plans come into effect, a broad sweep of grass plot will extend from the present Rogers Building, across Massachusetts Avenue and westward to a plaza area where, even now, startling changes are taking place. Plans for developing the plaza concept call for the ultimate removal of Bexley Hall, and the Technology Store of the Harvard Co-operative Society. Likewise, they call for razing the present "Tech Block" and for erecting in its place, a group of stores in a modern multi-story Student Center and Alumni Building. The Administration has made no commitments on these changes as yet; at present they are plans for the future which are receiving favorable consideration.

But already the plaza area boasts of two important and significant new structures which were dedicated on Sunday, May 8, during a Fortnight Festival of pageantry of cultural and social events from April 30 to May 14. On the eventful day of May 8, the Kresge Auditorium and the Chapel were dedicated to official Institute use. This outstanding event enabled the Institute to embark on a program in which the religious life of its students will be significantly strengthened. Such an aim is in harmony with the present concept of "educating the whole man" and strengthens the efforts of making M.I.T. a "university polarized around science."

The Plaza

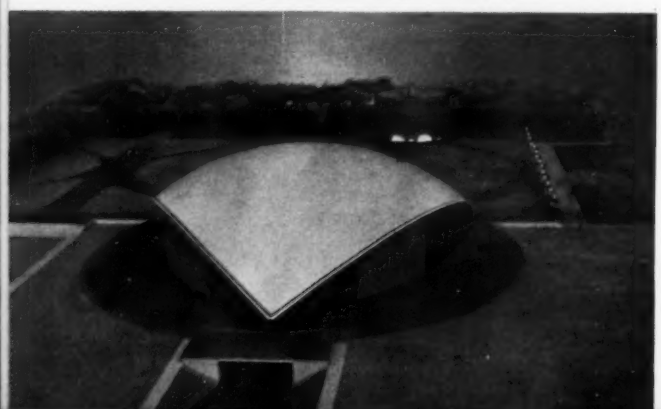
As one leaves the Rogers Building and faces west, he sees — interrupted only by traffic on Massachusetts Avenue — the broad plaza straight ahead on which the new Kresge Auditorium and Chapel are

View of the plaza, as seen from Massachusetts Avenue, with elevated terrace. This photograph was made as the last construction work was being done on the chapel (left) and the auditorium.

now located. Slightly toward the left is the auditorium, with its light spherical dome harmoniously complementing in the recreational area the two domes – atop Building 10 and the Rogers Building – which have long characterized the Institute's academic buildings. To the left of the Kresge Auditorium, and somewhat closer to the main Institute buildings, is the cylindrical-shaped Kresge Chapel.

The broad plaza is about three feet above street level, and is reached by a wide walk which leads from M.I.T. up five or six steps to plaza level. Wide stairs also permit one to reach the plaza level from open space off of Memorial Drive, near the Graduate House. The area immediately surrounding the auditorium is seeded with grass, and is free from obstructions of any kind. The area adjacent to the chapel, on the other hand, is planted with London plane trees (similar to sycamores), between which shoots of myrtle already show their violet flowers. At present the trees are diminutive, but in years to come they will provide a quiet shaded area in which the chapel may stand in tranquil seclusion, accessible to, but separated from, and in marked contrast to the busy bustle of academic activity on the east side of Massachusetts Avenue.

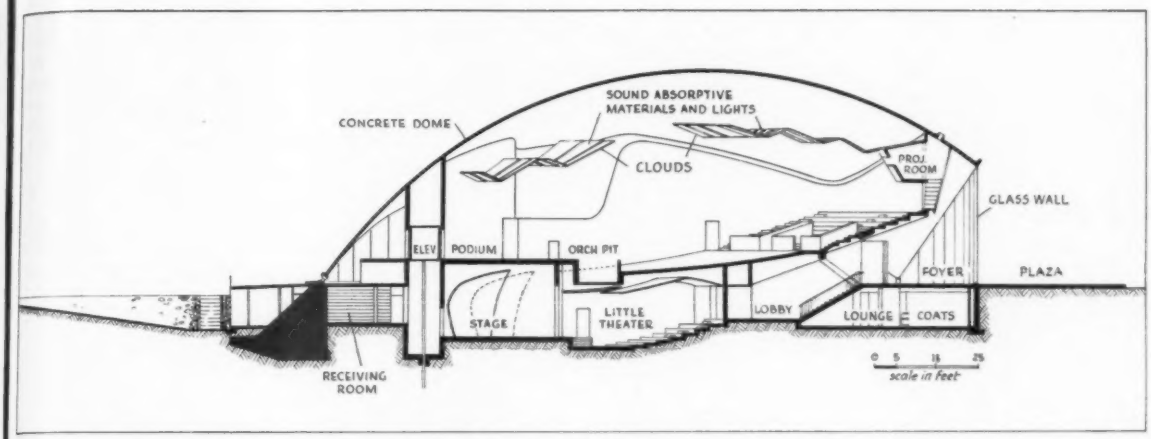
Model of auditorium and chapel gives a better idea of these buildings, and the plaza, than can be obtained from photographs made at ground level.



Auditorium Dome

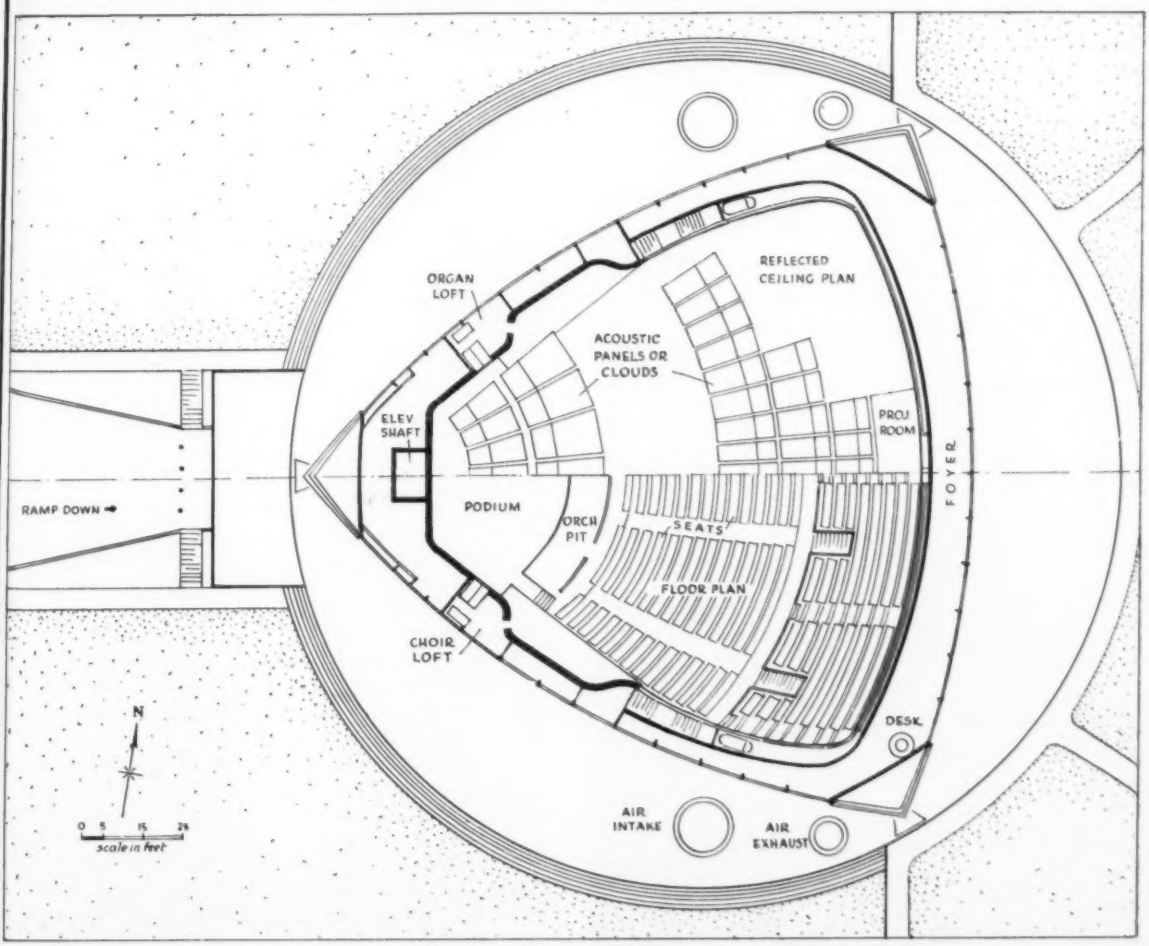
At first glance, the new Kresge Auditorium presents the appearance of a huge white billowing sail of concrete. The dome-shaped structure, which is actually one-eighth of a concrete sphere, is supported at three points of an equilateral triangle by deeply sunk abutments of steel and concrete. At each of these three corners, the dome tapers into an 8 inch × 8 inch steel pintle which rests on a steel bearing constructed so that the dome can move relative to the ground as it expands and contracts with changes in temperature. As shown in the section view on page 393, the dome rises to a total height of about 50 feet above ground at its apogee: the three points at which the shell rests on the ground are not structurally joined together. Structurally the shell floats free of the rest of the auditorium which is built up from the ground.

If the general appearance of the auditorium is that of a portion of a sphere raised above ground,



The new M.I.T. auditorium shown in section view (above). The large assembly hall, at ground level, has seats for 1,200 spectators. When the orchestra pit is raised to level of the podium, about 250 musicians can be accommodated on the stage. In addition, the Little Theater, at the lower level, has seats for 200 persons. These new "meetinghouse" facilities are adequate to accommodate all groups likely to meet at M.I.T. except those in conjunction with commencement day exercises, which, in recent years, have been held in the adjacent Rockwell Cage.

Plan view of the auditorium (below) shows two levels, divided by the axis of symmetry. The floor plan (lower half) shows the seating arrangement with four aisles in forward and five aisles in rear section. The reflected ceiling plan (upper half) shows the distribution of "cloud" panels which are hung from the spherical dome. Although primarily installed as part of the acoustic design, the clouds also conceal lighting and ventilating equipment.



Foyer of the auditorium, looking south, toward Memorial Drive. Near one resting point of the dome is an information desk and ticket booth. Door to the right leads to the seating area. Foyer light is obtained from direct lights in the circular area (above) which forms the floor of the rear section of seats and portion of the projection booth.

the plan view is trefoil, or an equilateral triangle with outwardly curved sides, as shown in the illustration on page 393. The glass walls, extending the full length between supporting points at the abutments, are cylindrically shaped in plan, and circularly arched from ground view. Day or night, the auditorium presents a striking appearance from inside or outside the building. This concept of spherical shell with trefoil plan is especially suitable for the construction of the auditorium since it makes the seating and stage a complete and well-integrated unit which most effectively uses available space.

The structural concrete dome is 3½ inches thick except at the corners which increase to 18 inches. The three abutments are about 160 feet apart. The dome or concrete shell weighs about 1,500 tons and, in its proportions, is thinner than an egg shell.

The exterior walls are composed of vertical panels of glass supported by steel-reinforcing members. The tops of the interior walls rest 4 to 6 inches below the concrete dome. The intervening space is filled by rubber gaskets to allow for movement as much as 1½ inches. As a result, contractions and expansions of the dome are not communicated to the walls, and the dome can "breathe" without affecting the inner structure which is built up from the ground. Steel window frames have been joined to the dome by slotted steel angles to permit slight movement for expansion and contraction.

Glass walls fill the space between ground level and the spherical concrete dome.

The construction of the concrete shell represents a new and interesting development in architecture. The crown of the dome was formed by building an inner structure of concentric wooden rings, supported by lightweight metal scaffolding. One- by six-inch planking was then bent over sleepers to complete the formwork. The steel reinforcing was placed above this. At the corners where the concrete is thicker and where the slope of the dome is acute, additional forms were placed above the reinforcing. The concrete was poured in three operations at separate times, beginning at the three abutments and working up toward the peak of the dome. An 18-inch upturned edge stiffens the shell and directs rain water to drains at the three abutments. Affixed to the upturned edge are a group of equally spaced exterior lights whose black housing has the form of truncated cones.

The concrete shell is covered by a felt membrane, two inches of glass wool, an asphaltic fabric, two inches of cinder concrete, and an acrylic plastic mixed with Fiberglas, beach sand, and other materials; it has a total thickness of 8 inches. This outer covering will serve to insulate the interior from cold and heat, and provide effective sound insulation from outside noises.

As one leaves the circular red brick terrace surrounding it, and enters the curved corridor or lobby of the auditorium, the form and function of the struc-

View toward the north, looking toward Rockwell Cage, from the foyer of the auditorium. Architect's model of the auditorium and chapel appears on the farther table near the glass wall. Stairs at the left lead to the lower level where the Little Theater, checkroom, and rest rooms are located. Offices and service and maintenance rooms are also on the lower level.

ture become more evident. The main floor is of red brick, with wall and ceiling color scheme of blue, green, and beige. A large round desk, serving as ticket booth or information desk, is located at the left, or south side, near one of the two main entrances.

Interior of Auditorium

From within the auditorium, as one looks out through the large walls of vertical panes of glass, a panoramic view of the Institute unfolds. To the east, and nearby, is Bexley Hall; then, in order, are the Graduate House, an open parking field, Baker House, Westgate in the distance, and the large athletic and recreational fields, the Briggs Field House, Rockwell Cage, the Armory of the Massachusetts National Guard, and, finally, the main educational buildings of the Institute.

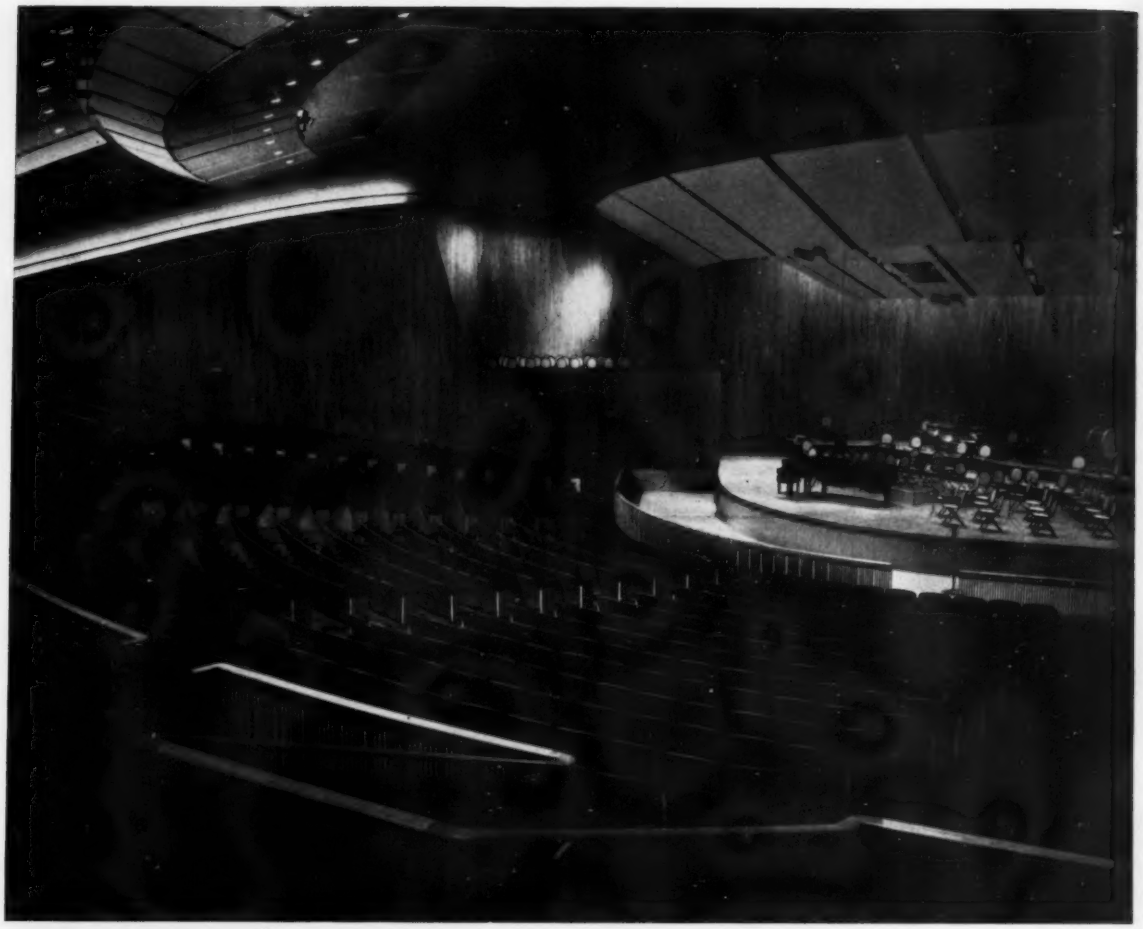
At the center of the corridor in the auditorium, almost at eye level, is a white marble slab with gold lettering. All who descend to the lower level, or casually stroll about the main lobby, are informed by this slab that the building is: "The Kresge Auditorium – The Meeting House of the Massachusetts Institute of Technology. Made possible by the generosity of the Kresge Foundation, founded by Sebastian S. Kresge. Dedicated May the eighth, nineteen hundred fifty five." Thus, in simple words, is recognized the benefaction of a true friend of the Institute whose foresight provides M.I.T. with social, cultural, religious, and educational facilities such as it has never before enjoyed.

From the glass enclosed corridor, access is had to the seats and stage by several entrances – so inconspicuous they seem to be almost hidden from view. The auditorium has seats for 1,238 persons. Since there are no columns or other upright members within the hall, each and every seat in the house has an unobstructed view of the stage or podium and its adjacent orchestra pit. The lower level of the auditorium contains a checkroom, lounges, a Little Theater seating 200 persons, two rehearsal rooms, a greenroom, three offices, and necessary service and maintenance rooms. The Little Theater extends about 15 feet into the ground, below the level of the plaza.

The interior of the auditorium is subdued, yet colorful. The blue-gray, dome-shaped ceiling is offset with wide walls of grooved natural oak paneling which is complemented by other woodwork in natural oak. The 1,238 seats are covered with heavy black cloth, and the metal seat bottoms and backs are enameled, at random, in six shades of blue, green, and orchid. Seats are arranged in two main sections, separated by a wide aisle parallel to the rows of seats; approximately as many seats are in the forward section as in the rear portion. There are four aisles in the forward section which lead down from the entrance stairs, and five in the rear. Seats are comfortable, and there is adequate leg room.

At the west end of the triangle of the auditorium is the stage or podium. With a seating capacity of 250 persons, the stage has a curved rear wall of wood paneling. Between the stage and the audience is the orchestra pit, forming a circular arc. When used for normal seating purposes, the pit is at the same level as the floor of the auditorium, but it can be raised to the same level as the podium to increase the effective stage area appreciably.

At the left of the stage is the choir loft which is sufficiently large to accommodate 75 singers, whereas the organ loft is to the right of the stage. To be installed this fall, the large modern organ will be set in such a way that its own working pipes and console compose into an attractive and organized unit in the auditorium. It can be used for individual organ recitals, as well as with orchestra and choir on the stage. This instrument will be a significant addition,



(Above) *Interior of main auditorium as seen from north corner of large assembly hall. Effective area of the podium may be increased by raising the orchestra pit to stage level. Choir loft is above Exit sign at end of orchestra pit. Pleasant, soft indirect lighting is obtained from recesses in the side walls. Direct lighting, for audience and portion of stage illumination, comes from light fixtures in the "cloud" panels hung from the dome.*

Electrical control panel and console for controlling stage lighting of the large assembly hall.

Side view of the Little Theater, immediately below the auditorium. Side stages are provided for ready change of scenery.

not only to M.I.T. but to the musical world of the time in which we are living.

Acoustic Design

Usually in an auditorium, a ceiling of plaster is dropped below the roof structure. This suspended ceiling can carry lighting and ventilating equipment, and can be shaped – quite independently of the exterior structural form – to conform with acoustic design. A different approach is used in the M.I.T. Auditorium. Here the ceiling is simply the inner surface of the structural dome. The functions of lighting, ventilating, and acoustics are then served by free-hanging panels that obscure only a fraction of the sky-like gray ceiling.

These panels, aptly called "clouds," are flat rectangular forms, faced with hard white plaster, specially angled to reflect sound usefully throughout the room. The clouds, which fan out from the podium, are concentrated over the stage and over the rear seating area. They carry loud-speakers, ventilating equipment, and lights reached by catwalks.

Sound absorptive material laid on top of the clouds – not on the inner side toward the audience – helps achieve the desired reverberation characteristic. The entire rear wall of the auditorium is also faced with absorptive material behind glass cloth, for additional control of echo. Acoustic design also influenced the contours of wood-paneled walls.

An interesting feature of the cloud construction is that the amount of absorptive material can be increased or decreased to modify the acoustic properties of the room without in any way altering its general appearance, or without requiring any appreciable reconstruction expense.

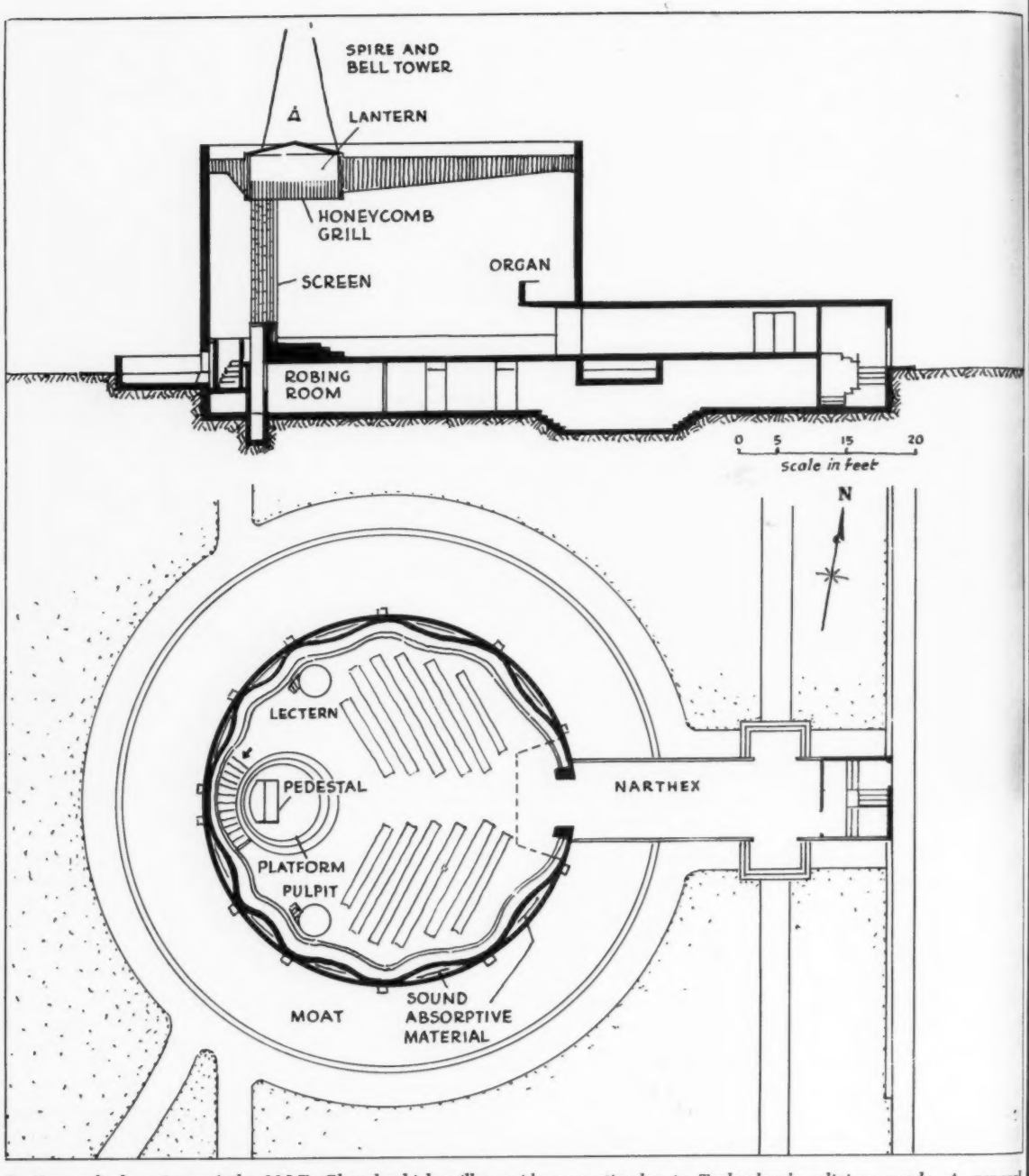
In any auditorium intended for both speech and music, the multi-purpose of the room presents a challenge to the acoustic designer. A compromise must be effected between brilliance and clarity on one hand and mellowness and blending of tone on the other. In the Kresge Auditorium, a speaker on the platform is heard with high intelligibility at all seats. The auditorium is especially effective for piano solos and small musical ensembles. Orchestral music is very clear, but as one music critic has pointed out, musicians will have to learn how to use the auditorium to give a flawless performance.

Lighting

Seeing, as well as hearing, has been given special attention in the auditorium. For general illumination, the entire auditorium may be flooded with direct, as well as with indirect, light. Soft, indirect illumination is provided by lights at the side walls, between the oak paneling and the spherical dome. During a performance, the light above the audience may be darkened while ample lighting is provided for the podium. Lights, hung from the dome or from the plaster "clouds," which are provided mainly for acoustic treatment, supply direct overhead illumination.

To the rear of the audience, and well above the seats in the last row, is a large and well-equipped projection booth. From this booth, spotlight beams can be projected for special lighting effects on the stage. The booth is amply equipped with projectors for slides and motion pictures, for either professional or amateur slides and films. The needs of television have also been taken care of, for television cameras and the necessary additional lighting can be brought into operation in the main auditorium. The projection booth also houses audio-control equipment for sound motion pictures, for playing transcribed music, for creating special sound effects, or for speech amplification. Despite the adequate provision for good visual and aural appreciation, however, the audience is not conscious of the presence of loud-speakers or other sound apparatus, and the lighting fixtures are equally unobtrusive.

The stage of the Little Theater is well suited to use by the M.I.T. Dramashop and the Staff Players, both of whom have already put the new facilities to good use.



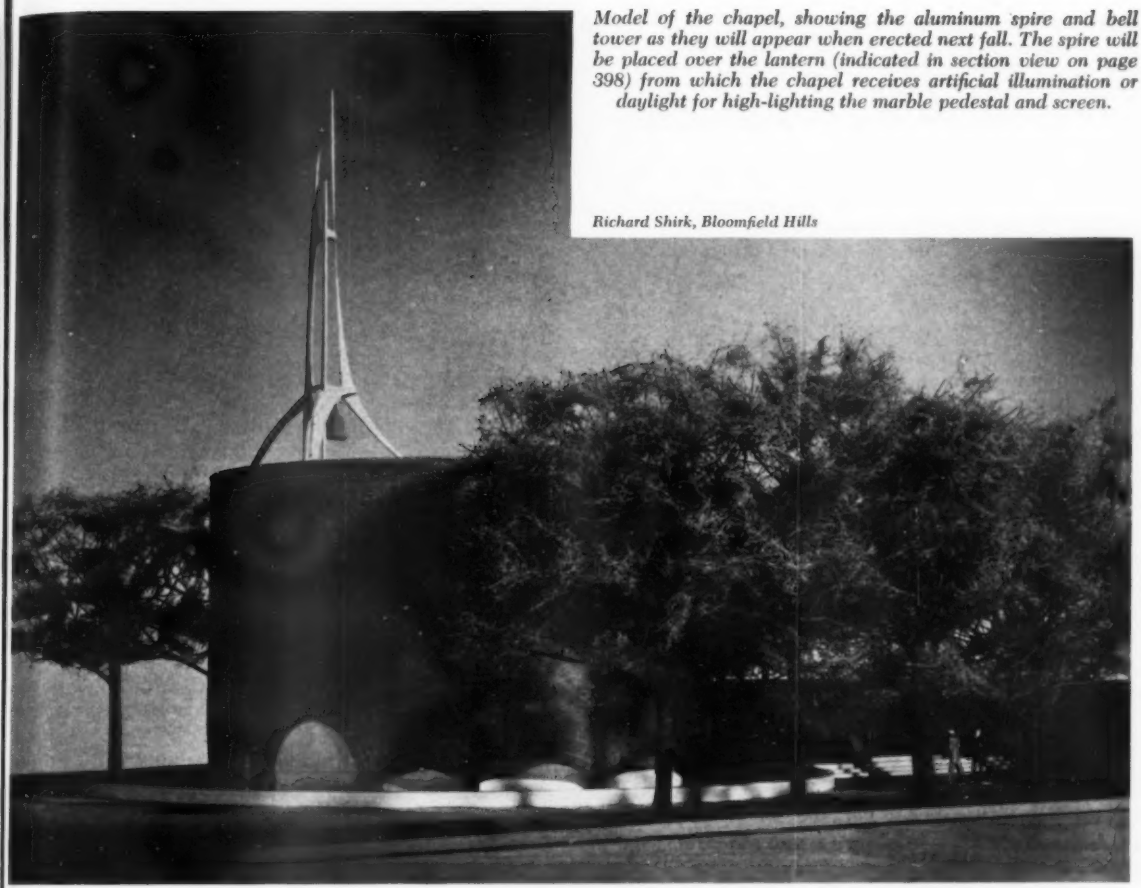
Section and plan views of the M.I.T. Chapel which will provide new stimulus to Technology's religious needs. A general view of the interior of the chapel is shown in the Frontispiece illustration.

An ample number of vomitories, together with wide aisles, permit the audience to leave their seats quietly and quickly, and walk around the outer corridor during intermissions. Wide spaces between rows, and seats of ample width, also contribute to the comfort of the audience and expedite entering and leaving the performance.

Lower Level

The lower level of the auditorium contains the Little Theater seating 200 persons. Like its bigger brother above, the Little Theater is free of obstructing members. It contains a stage suitable for plays, with side stages for scene preparation. The theater is sufficiently small and conventional as not to require the unusual acoustic treatment accorded the auditorium. The ceiling contains lights which, pointing downward and toward the stage, provide exceptional theatrical lighting on stage.

The lower level also contains a checkroom, two large rehearsal rooms, a sheet music library, room for service facilities, women's dressing room, men's dressing room, office for J. N. Murphy, manager of the auditorium, office for J. D. Everingham, Director



Model of the chapel, showing the aluminum spire and bell tower as they will appear when erected next fall. The spire will be placed over the lantern (indicated in section view on page 398) from which the chapel receives artificial illumination or daylight for high-lighting the marble pedestal and screen.

Richard Shirk, Bloomfield Hills

of Drama, office for Klaus Liepmann, Director of Music, a greenroom, an instrument room, a freight elevator, electrician's room, emergency generator, and two telephone booths.

The ground level also contains enormous air-conditioning units. The equipment is adequate to provide an ample supply of fresh air to the auditorium and to the Little Theater, simultaneously, and operates with such quietness as to be completely unnoticed by the audience.

The refrigeration equipment which provides summer cooling for the auditorium is used to make and maintain ice on the new skating rink just north of the auditorium. It can keep the rink in satisfactory hardened condition for skating when the outdoor temperature is as high as 50 degrees F.

The Chapel

The chapel has been designed to serve the needs of Roman Catholic, Protestant, and Jewish faiths. Here, as in the auditorium, daring was required to make a complete break with traditionalism in an attempt to provide a retreat for religious services and contemplation in a community bristling with activity.

Externally, the chapel is a structural brick cylinder 50 feet in diameter and about 30 feet high. The plan and section views of the chapel are illustrated in the line drawings on page 398. The surface of the chapel is of red brick, with occasional twisted elements, providing a rough-textured appearance. The chapel is surrounded by a water-filled moat about 2 feet deep and 12 feet wide, so that the over-all diameter of the moat is about 75 feet. The chapel has no windows, but receives daylight illumination through eight arches of varying diameter, at the base of the outer cylindrical wall. The outer cylindrical shell is supported by the arches which, in turn, are set in the moat. With its bell, an aluminum spire will be erected atop the chapel.

Approach to the chapel is through a rectangular corridor or narthex with sides of neutral gray-stained glass. The narthex is about 50 feet long and crosses the water-filled moat.

The concept of the water-filled moat was adopted to enhance the feeling of isolation of the chapel from the rest of the surroundings. But the moat fills an important role in an unusual interior lighting scheme. Sunlight, striking the water in the moat, is reflected upward into the arches, between the outer and inner cylindrical surfaces or walls of the chapel. Sparkling dots of light dance upon the walls inside when sunlight strikes the rippling surface of the water in the moat.

Chapel Interior

As one enters the chapel from the narthex, the principal item of interest is the large pedestal of

white marble, lighted from above. The pedestal rests on a circular platform about 15 feet in diameter, and is raised above the floor of the chapel by a platform of three raised steps. To the left of the platform is the pulpit, while the lectern is to the right. Above the entrance to the chapel and adjacent to the narthex, is a balcony which contains a small pipe organ. The chapel has cathedral chairs for approximately 130 persons. Seats can be arranged for different functions but will often be placed with a wide aisle down the center from the narthex, and additional aisles along the walls.

Above the marble pedestal is a 12-foot circular skylight (or lantern) and deep honeycomb light baffle providing daylight or artificial illumination. The electric lights in the lantern are directed downward on the marble pedestal. Immediately beyond the pedestal is a screen consisting of vertical rods and gilt metal plates which act as light reflectors for the illumination from the circular lantern immediately above the pedestal. Behind the screen, stairs lead down to the robing room.

The ceiling of the chapel is dropped in a shallow conical shape, which assists in diffusing sound. Lighting, directed downward on the audience, and at the organ, pulpit, and lectern, comes from lights in the ceiling which is painted dark green-gray. The honeycomb in the lantern directs light toward the pedestal without diffusing it into the eyes of those in the first row.

The interior of the chapel is also built of rough red brick. The interior wall is separated from the outer cylindrical structure. Although the over-all general impression is that the interior of the chapel is roughly cylindrical in form, actually the inner brick wall is laid as a group of irregular plane waves. Introduced primarily for acoustic reasons, this serpentine construction diffuses the sound and avoids focusing it into the center of the chapel. In addition, sound is diffused from the ceiling, as mentioned.

Beginning at a level about 3 feet high and extending to the floor of the organ loft, open brickwork grilles appear at intervals where the serpentine inner wall diverges from the cylindrical outer wall. This open brickwork is backed by sound absorptive material. Acoustically the chapel is divided into a lower level with acoustic absorption, and an upper level, where the untreated brick provides desirable reverberations for organ music.

The separation between the serpentined brick wall and the inner railing is bridged with glass at about waist level. Through this glass, light reflected from the water in the moat plays upon the interior red brick walls. Oak grooved paneling, stained walnut, rises to about waist height. The floor of the chapel is Roman travertine set in a diamond pattern.

The organ in the chapel is in an elevated position above the entry. This instrument is a much smaller unit than that in the auditorium and is comparable in its design to those that existed when Bach was composing. In recent years there has been a return to the purer music consistent with the restrictions of this instrument. One use of the chapel will be to give small recitals with the organ, and possibly a few other instruments, in conjunction with a choir. The

(*Continued on page 430*)

A small but musically interesting pipe organ is installed above the entrance to the chapel. Open brick grillwork, below the level of the organ loft, is backed by acoustic absorbing material. The upper portions of the serpentine inner walls provide the desired reverberation for organ music.

The Acceptance Address

The New Auditorium and Chapel Can Be Used to Re-Emphasize That Scientists and Engineers Must Concern Themselves with Qualities of Mind and Soul We Call Spiritual

By JAMES R. KILLIAN, JR.

No amount of dirty weather can dampen our sense at M.I.T. of joyous realization this afternoon. The dreams, the hopes, the plans of years are now fulfilled, and we welcome you to our celebration and dedication with pride and happiness. In celebrating, it is appropriate that we first give credits to those who brought this about.

"Let us now praise famous men" wrote Ecclesiasticus in the Apocrypha, and then in his list of men to praise gave prominence to the builders, the artificers, the craftsmen, and the workmasters, whose prayers are expressed "in the handiwork of their crafts."

In this spirit we praise today the skilled and imaginative men who created these buildings to fulfill the purposes we intended. Eero Saarinen and Associates of Detroit have been the architects. Because I feel that the creative work which architects do is so often inadequately recognized, I take delight in emphasizing Eero Saarinen's achievement, together with the local supervision provided by the associated firm of Professors Lawrence B. Anderson, '30, and Herbert L. Beckwith, '26. We feel special affection for Messrs. Adams and Wood who worked here on location for their firms.

The architect's concept for this auditorium could not have been realized without advances in the art and science of structural engineering. A thin shell dome stretching almost 200 feet across and enveloping nearly half an acre presented problems of no ordinary kind which could have been solved only by skilled engineers. For their success in solving this problem, I pay tribute to the New York engineering firm of Ammann and Whitney.

It is equally appropriate that I should express our appreciation to the George A. Fuller Company which built the buildings, and to its representatives, Mr. Paulsen and Mr. Bates, who coped admirably with the many complexities involved in their construction. I would speak, too, of Robert M. Kimball, '33, Carl M. F. Peterson, '29, and Philip A. Stoddard, '40, officers of the Institute who have seen the project through for M.I.T., and to James Murphy who manages the building with deep affection for it.

There are many others who played important parts. Other members of the Faculty such as Professors Howard R. Bartlett, William C. Greene, and Klaus Liepmann, and members of the student body served with Professor Richard H. Bolt on the committee that helped set up the specifications for the theater and auditorium. Professor Bolt and his associates of Bolt, Beranek, and Newman designed the acoustical features of both buildings. The lighting system, so important in an auditorium and chapel, was designed by Stanley McCandless.

Harry Bertoia designed the screen behind the altar, and Theodore J. Roszak was the sculptor for the spire which is to crown the chapel. And finally I cite with particular gratefulness our Building Committee and the Dean of our School of Architecture, Pietro Belluschi, who also serves as architectural consultant to the President and the Executive Committee.

I offer our deep gratitude also to the two Alumni and Corporation members, Alfred P. Sloan, Jr., '95, and Marshall B. Dalton, '15, who led the Development Program to which the Kresge Foundation made its gift and which raised a substantial part of the additional funds to complete this project. How deeply generations of M.I.T. students will be indebted to these two dedicated and generous trustees!

At the end of this program, when Mr. Kresge speaks, I wish then to pay tribute to the donor and express our appreciation to the great Foundation whose generous benefaction made all of this possible.

With these inadequate and incomplete expressions of appreciation to those who donated and created these buildings, let me also add some notes on the educational and spiritual objectives we seek to fulfill through their use.

In architecture and in other fields, educational institutions can be pace-setting patrons of the arts. This they cannot do merely by studying the old, however important that may be. They must also have the courage to create and sponsor the new.

M.I.T.'s Religious Program

An institution which embraces general as well as professional education must give attention to man's spiritual life — to the place of religion in man's history, in contemporary society and in the life of the individual. It also must encourage an understanding of those postulates which underlie our society's concept of virtue — the unifying ideals and standards, the moral and ethical beliefs which men in general agree upon but reach by diverse paths of faith, philosophy or social pressure. The responsibility to deal with these great matters is inherent in any program to educate young people adequately and broadly. Their all-round development requires a growth of the spirit as well as the mind.

— from President Killian's Report to the M.I.T. Corporation, October, 1954

An institute of technology, especially one with the oldest school of architecture in the nation, has a responsibility to innovate in its architecture in the same spirit that it seeks scientific innovations in its laboratories. Its intellectual resources and outlook, furthermore, permit it to be bold and advanced in the design of its buildings in a way that other institutions might not be able to justify. The extravagant statement has been made that only M.I.T. would have had the self-assurance to build this domed auditorium and the round chapel. This statement gives too much credit to M.I.T., but it does make the point that this kind of institution has special resources and reasons to build boldly and experimentally. It is my own view that while cherishing and preserving all that is fine of the old, we can no longer justify antiquarian architecture for the new. Instead of our campus architecturally becoming a "museum of caution and paralysis," its buildings each should express the best methods and materials and the best aesthetic ideas of the periods in which they are built.

Architectural innovation is accompanied by controversy and reveals deep divergencies in taste — and here I speak knowingly. This is the price of creativity in the arts, and we should be willing to risk the controversy in order to achieve a mutation in taste or to afford the searching, creative minds of our time an opportunity to try new solutions.

Transcending the architecture are the uses of the building. In ordering and organizing its community life, the early New England town built a meetinghouse and centered there its civil and religious life. It was a house of many uses. There the men and women went to worship God, to hold their town meetings, and to further their cultural and civil interests. The meetinghouse was the nucleus around which formed concepts and traditions of civility, of social organization, of religious life, community responsibility, and self-government.

In visualizing an auditorium for M.I.T. we sought a building to provide a similar nucleus for our academic community, especially for our student body. We felt it would be proper and possible to design a building which would be appropriate for worship, for academic ceremonials, for educational meetings and conferences, for music and drama, and for the maintenance of M.I.T.'s civil life.

In this sense, the Kresge Auditorium serves as M.I.T.'s meetinghouse. With the auditorium, its associated devotional chapel, and with the new student union we hope some day to build on the north side of the plaza, we shall have here grouped about our plaza, or common, those buildings which will provide for the extracurricular life of our students and Faculty. Already the auditorium has brought a quickening of our community life and given new impetus to the extensive musical and dramatic activities of students and staff. It is significant that the first conference held in this meetinghouse was one initiated and superbly managed by our student government and dealing maturely with the problem of discrimination and selectivity in colleges.

While the auditorium can be used for religious meetings involving large numbers, the devotional chapel will serve smaller groups as a building designed exclusively for religious use. It gives, as the inscription reads in the chapel, embodiment to the responsibility of the Institute to maintain an atmosphere of religious freedom wherein students may deepen their understanding of their own spiritual heritage, freely pursue their own religious interests, and worship God in their own way.

In addition to the civil, the educational, and the spiritual interest which they serve, the auditorium and chapel emphasize two other important aspects of our institutional mission and responsibility.

First, they express, in our modern way, the conviction that beauty and benignity and nobility of environment are as important influences in education as Plato long ago said they were. Beauty of environment should be as indigenous to this kind of institution as the more traditional kind of university.

Second, the spirit behind these two buildings reaffirms the unit of knowledge and of creative activities. Science and art spring from similar creative impulses and serve to strengthen each other. In the deepest sense, the liberal and humane outlook is inherent and essential in the domain of science as it is in other fields of learning. These buildings can be used to re-emphasize that science properly used is a great moral and liberating force and that the scientist and engineer, full as much as other professional men, do and must concern themselves with values and virtue, with those qualities of the mind and soul which we call spiritual. All these great matters are the concern of this institution and are natural parts of its educational mission. They reflect the new synthesis of educational tasks and ideas that has been taking place at M.I.T. as it moves steadily and inevitably toward a new kind of institution indigenous to American society and serving its needs and ideals in a new way.

In accepting and dedicating these buildings, then, we do something more than mark the completion of two structures. We celebrate the generosity and public spirit of the donors. We celebrate the ideas, ideals, and aspirations which these buildings are intended to further and to serve. We reaffirm the kinship of scientific, aesthetic, and spiritual values in our corporate life. We celebrate powerful new concepts in education.

A century and a quarter ago, Wordsworth wrote these lines, which might appropriately be inscribed in the chapel we dedicate:

> They dreamt not of a perishable home
> Who thus could build. Be mine, in hours of fear
> Or grovelling thought, to seek a refuge here;
> . . . or let my path
> Lead to that younger Pile, whose sky-like dome
> Hath typified by reach of daring art
> Infinity's embrace.

In these lines, inspired by King's College Chapel at Cambridge University, England, we find the appropriate note for this joyous occasion of appreciation, dedication, and affirmation, in Cambridge, Massachusetts.

The Dedicatory Address

Technological Studies, Intelligently Directed, Can Provide an Environment for Deepening Our Sense of Spiritual Values

By E. N. VAN KLEFFENS

THERE is no doubt that the dedication of the two remarkable and remarkably beautiful buildings to be inaugurated here today constitutes a very significant event in the admirable history of M.I.T. You have honored me by expressing the wish that I give the dedicatory address on this auspicious occasion. Gladly have I crossed the Atlantic to comply. I would have done this, and with pleasure, even if nothing but the buildings were concerned, deserving, as they do, the admiration of all. But what made me twice eager to accept was the deeper meaning of these two impressive manifestations of contemporary architectural art. I do not know whether it lies in my power adequately to express their significance, but I shall do my best.

First, the buildings as buildings. As deviations of the conventional post-and-beam construction, and breaking as they do with the traditional oblong or, in the case of the auditorium, angular wedge shape, both structures are a bold challenge to established forms and habits of thought. Far from being the product of an architectural whim or caprice, they are the outcome of much original and daring thought, in the field of aesthetics as well as in that of function, logic, construction, and economics. They mark a date, and perhaps an era, in architecture, and, broadening in just proportion an opinion expressed not very long ago in an American professional magazine, I feel justified in saying that "the world's architecture and building are not likely to be quite the same after M.I.T.'s new center is finished." They are the fitting adornment on the campus of an institution devoted to advancing the boundaries of knowledge – creative, pioneering, respectful of acquisition, avid of improvement.

Consider the chapel. It has an unfamiliar cylindrical shape. Is that a design unfamiliar for its own sake, new for the sake of newness, astonishing merely to attract attention? Far from it, and I feel sure that even the many who do not know will share with those initiated the experience that the rounded shell, giving a sense of protection through enclosure, is in keeping with that feeling of inner security true religion imparts to the fortunate faithful. The unearthly light pervading the interior, most ingeniously obtained, takes our thoughts to purer and more enduring spheres, the beam shining from on high on the altar, relating it to its sublime significance, and providing a focus without which there would be no fixity, no concentration, no promise of peace for the confused and troubled soul.

Second, the auditorium. Its shape aims at bringing together audience and speaker, at promoting that contact of minds and senses which in more conventional halls it is so often difficult to bring about. Who will deny that Mr. Saarinen's talent, given full rein thanks to the Kresge Foundation's munificence, succeeded in conceiving a building which, ideally suited for many purposes, contrives to combine usefulness with lightness, and space with grace? The nonsectarian chapel serves one purpose only, though each is welcome to worship according to his creed. The auditorium has been designed to adapt itself to a great many functions, its multivalence being reflected in the dome – a shape which could give shelter to any surface of its size regardless of purpose.

There is a third essential: the plaza, promoting and determining balance and harmony between the two buildings, placing each in its proper perspective. Together with the chapel and the auditorium, it forms an organic whole. Trees are to soften outlines and screen excess of contrast. Such is the aggregate, pleasingly offset by surrounding campus buildings.

This summary description is no doubt very incomplete and, like any description of beautiful buildings, fails to do them full justice. Description can be no substitute for personal inspection, let alone for the work of art described. In any case, I trust I did not commit the sin of weakening by exaggeration. But, however that may be, I hope that even a distant listener or a casual reader will sense that these new ornaments of the M.I.T. campus are not mere glorifications of material achievement. They are, in fact, expressions of spiritual values of the highest order, and this is why they are elements characteristic of an essential and most important feature of what the Institute stands for. They also hold an impressive warning in the dark and dangerous times the Western world is traversing. Let me explain.

There is a danger inherent in technological education and research of which those responsible for the future of M.I.T. and of its Alumni fortunately are well aware. The danger lurks not so much in what is ascertained by the student as in its application and in the mentality it may create.

If I may begin with a dangerous mentality technological education and research can create, let me invite your attention to the fact that they may lead to an undue narrowing of belief and faith. A state of mind may be induced in which no place is left for belief except in what we see demonstrated in the test tube. This is a grave and noxious error. There is a

M.I.T. Photo

In delivering the dedicatory address in the Kresge Auditorium on Sunday, May 8, His Excellency, E. N. van Kleffens, Minister of State of the Netherlands stressed the need for high moral values in using knowledge which man achieves.

great deal of truth and faith, as we know them in our hearts, which is incapable of scientific demonstration. One of the glories of science is that, by reducing somewhat the immense areas of human ignorance, it has also reduced superstition, bias, belief in sorcery and witchcraft. But there remain the great Verities which are taught by religion – incapable of scientific demonstration, but nonetheless true. The difference between good and evil cannot be expressed in any scientific formula, and yet all human beings, irrespective of race or creed, know its existence, a revealed fact of the first order. Let the new chapel, and also the auditorium, remain a constant warning that, just as technology cannot exhaust truth, it is not qualified, and therefore should not attempt, to monopolize belief.

In the second place, a word about the danger which technological studies may create in respect of the application of their findings.

From one discovery, science has moved to another, especially in the course of the last century and a half, during which the pace has singularly quickened. This unbroken record of achievement is apt to engender a state of mind in which nothing seems impossible to man. He thereby tends to become a law unto himself, the measure of all things, pushing further and further into the Vast Unknown, and the heady wine of his success may well lead him to believe that he is not only at liberty to pursue his discoveries, but also to apply what he has found according to his will. Seeing no boundaries to knowledge, he may lose sight of the boundaries which limit its application. One of the dangers of science is that it may make man forgetful of divine and human laws.

We are brought face to face here with very old truths and findings. The idea of a natural law, immutable and perennial, the foundation of what is meet and just, found in the human conscience and binding all human beings, a law no human authority can change and from whose validity there is no escape, is of great and venerable antiquity. Those in ancient Greece, who, losing sight of what behooves Man as being just and lawful, were guilty of overweening pride, fell victim to the vengeance of the Gods; Hesiod wrote about it, and it is a frequent theme in the great Greek tragedies. In the Bible you find a kindred idea: those who break the Lord's Covenant provoke his wrath: thou shalt not tempt the Lord thy God, says the Old, as well as the New, Testament. In addition to these divine laws, there are the man-made enactments. All this means amongst other things – and it undoubtedly is a truth as valid today as it ever was – that man may not do with his knowledge as he pleases. There may be no boundary to what he may discover, but there *is* a boundary to what he may do with the discovery.

These divine and human laws which set a boundary to what man may do with his scientific discoveries are something science cannot reveal to him. The reason is simple. Science is concerned with cause and effect, but not with norms, that is, rules for what is – and what is not permissible or lawful. To ascertain these rules, which are naturally of vital concern to every human being and to every society of human beings, the scientist must turn elsewhere, to the sacred places where these norms come to the surface: to religion, to law, to philosophy, including ethics and aesthetics. That is why, next to religion, the scientist, if he wants to be sure of remaining on safe ground, is in need of a study of what in M.I.T. is called the Humanities, and it is the great merit of your remarkable Institute that it has discerned this great and important truth from the first. Undoubtedly, study of the humanities will also help to bring about a solution of the many social problems arising in an industrial age of rapidly increasing automation, problems which in their aggregate may soon demand the highest form of precautionary measures in a very wide field if disturbing maladjustments are to be prevented in our complex modern society.

Religion and study of the humanities, as well as a recognition of their compelling importance if all is to go well with us, and if we are not to be the victims one day of our own inventiveness, seem all the more necessary when it is recalled that, whereas in all Western – and in several Eastern – countries the domination of matter has made great progress, no one can say that anything like comparable progress has been made in curbing more primitive urges within our nations and ourselves towards self-assertion and expansion at the cost of others. The Soviet

Union seeks to enslave the world. We of the West do not want to enslave anyone, but do we (not just one country, but many) not often ask (to give only one example) for protection of some national branch of industry regardless of the fact that thousands of families in other countries may thereby be thrown out of work? This example may be multiplied.

So far as the humanities are concerned, their task is, it seems to me, essentially to give a sense of measure in all things, and a better perception of what is reasonable. It is therefor that they exert such a marked civilizing influence. The constant application of reason, truly a great acquisition, has had its ups and downs in the course of history. In France in the Eighteenth Century, for instance, it played a leading part, and so it did, not without the influence of French civilization, in the young days of your great Republic. But then a reaction set in: feeling, by nature rebellious to restraint, was enthroned sometimes next to, but often above, reason and measure; it cannot be said that this reaction has entirely spent its force even today. There is, of course, no doubt that feeling should have its due share, so long as it does not gain the upper hand, for its mainsprings are obscure and unfathomable, and it is therefore liable to lead to excess – the very counterpart of reason and measure which are its natural moderators. Certainly in an age in which technological power can so easily and so dangerously be allied to unbridled feeling, it is of the highest importance that measure and reason, those beneficent gifts of the Gods, should be restored to the place of honor which has so frequently been withheld from them.

All these considerations apply with particular force now that advanced technology has found the means to split or fuse nuclei of certain atoms. For we have now forces at our command which, if wrongly applied, may bring about the destruction of the human race, and perhaps even changes in the cosmic structure of the universe, with incalculable consequences. Even if applied on a smaller scale, reason, and not feeling, should dictate their use. Applied for peaceful purposes, these forces can be a blessing to the human race which sees other sources of energy dwindle. So far as their application for welfare is concerned, I must leave to those responsible the unenviable task of defining the circumstances in which their use would be justified. All I can say is that it is by cultivating reason and self-restraint that we can find our way in the disturbing perplexities which the inventiveness of our own age has put on our path.

It is therefore, as I said, most fortunate that M.I.T. has from the beginning discerned the importance of religion and of the humanities. Of that importance, the chapel and the new auditorium are eloquent symbols. Technology, the never-ending quest for the betterment of human existence, was born with the human race; it is natural to it. But if technology is to assist and not to overpower us, if it is to remain a blessing and not to become a curse on all our houses, a disciplined servant and not a purblind master, then we have to submit it to the tempering influence of the norms of faith, of insight, and of duty.

So far for the fundamental decision of M.I.T. to give religion and the humanities their due place in students' activities, and the symbolic illustration of that decision in the form of the new auditorium and chapel.

Let me say a word about the spirit in which that decision has been carried out.

There was, in this respect, an obvious choice between two systems. One was to opt for a dogmatic approach, for something like an M.I.T. state religion. Nothing (if as a foreigner I may say so) could have been more un-American. And since M.I.T. is one of the manifestations of Americanism at its best, it chose the other system, based on that broad tolerance which is one of the mainstays of your great Nation. Strange as it sounds, there yet is no doubt, and there have been several examples in history, of the fact that, in favorable circumstances, a position of strength may be built up on a basis of intolerance. But the United States, and M.I.T. in particular, have shown that a most profuse flowering of the arts and sciences can be fostered on a basis of live and let live, tempered only by a happy and due regard for common decency and public order. It is in this spirit that M.I.T. has from the beginning wanted the Faculty and students to think for themselves, believe for themselves, speak for themselves, realizing that *"du choc des opinions jaillit la vérité."* We breathe here the fresh, unstifled air of free thought, free inquiry, free expression, and we are face to face with the care of scientific liberty, the essence of our Western tradition. The doctrine which pervades the Institute in this respect has been admirably and authoritatively stated by the Corporation Executive Committee; it may be summarized as follows: no regimentation or control which dictates to scholars the opinions and doctrines they must follow – diligence and loyalty in citizenship, without hidden allegiance or obligations necessitating distortion of research or teaching in accordance with dictates from without.

The chapel, far from being sectarian, is open to all faiths and creeds. As your President has stated recently, its purpose is twofold:

> *"first,* to stand as a symbol of the place of the spirit in the life of the mind and as a physical statement of the fact that M.I.T. has a right and a responsibility to deal with ideals as well as ideas and to be concerned with the search for virtue while we become proficient in the search for things; *second,* to provide ready opportunity for students and other members of our community to worship as they choose, to have on campus a building, beautiful and evocative of reverence and meditation, where those who wish may enter and worship God in their fashion."

There will be no special privilege for any faith; that its use should give no legitimate cause for offense to others is guaranteed by the spirit of mutual forbearance so characteristic of this great seat of learning. Its dedication today is a humble acknowledgment of powers greater than that of man, an act of reverence for the Creator of that immense and majestic universe we understand so little in spite of all our progress.

The auditorium will serve, as I said, many purposes. Any appropriate activity worthy of being car-

(*Concluded on page 434*)

The Affirmation

The More Power Science Places in the Hands of Man the More He Needs a Sense of Moral Value to Guide Him in Use of That Power

By THEODORE P. FERRIS

WE have come here to dedicate two buildings, an auditorium and a chapel. A new building is not by any means an unusual sight; almost everywhere you look you can see a building either in the process of construction, or just completed. But these two buildings are different; they are a sign of something.

They are a sign of a change in climate, and I do not mean a change in the weather. I mean a change in the atmosphere of our whole approach to life. Not so long ago we thought that man was the master of life's mysteries. We made such tremendous strides in our understanding of the natural universe that we presumed to think that there was nothing beyond the reach of our inquiring minds. Science unlocked so many doors in the skies above, and in the earth around and beneath us, that it was led to believe that there was no mystery which in time it could not comprehend and no riddle which, if given the brains and the patience, it could not solve.

Times have changed. The doors that science so graciously opened have led us into mysteries far vaster than our fathers ever dreamed of, and instead of solving the riddle of life, it has extended it to include not only ourselves and our strange and unpredictable ways, but also the origin and the meaning of life itself. When we consider the heavens, we see more than the moon and the stars. We see solar systems and constellations that the psalmist never imagined, but when we look at man and ask what he is, and why he is here, and where he is going, we know little more than the poet of Palestine.

Indeed, we are beginning to see that he knew some things that we had forgotten. He knew that the ultimate mystery of the universe in the long run escaped him, and he was humble before it. He knew that everything we are, and ever hope to be, is derived from sources outside ourselves and over which we have no final control. He knew that any meaning we may ever find in life must be found in the God from whom all life comes.

These buildings, especially the chapel, are a sign that we are beginning to see that we have not by any means outgrown the primeval knowledge of the psalmist; that over and above all our efforts to understand the majestic operations of the universe, the Ultimate Reality remains, ineffable though not unknowable, with which man must come at last to terms. This is the religious view of life. It does not contradict the scientific view of life any more than the engineer's approach to a problem contradicts the artist's. The two go together hand in hand. Religion without science is almost sure to become superstition, and science without religion is almost as sure to become a lifeless skeleton of facts and figures.

An article in the New York *Times* recently commented on the Trans-Atlantic Broadcast Anniversary. The writer reminded us of the words we so often heard in those early days of transatlantic broadcasting: "Due to atmospheric conditions over which we have no control our commentator from Paris will not be heard at this time." Then he went on to say: "The phrase had and still has a ring of adventure to it, a graceful submission to larger forces." The chapel which we are dedicating today is a sign that the leaders of one of the greatest scientific schools in the world are aware of the fact that there are "larger forces" to which man must make, sooner or later, a graceful submission.

It is also a sign that they recognize that man is a more complicated creature than perhaps they once thought him to be. Psychologists and physiologists cannot completely analyze him or explain him, and all the engineers, mathematicians, physicists, and astronomers in the world cannot ultimately satisfy him. Man cannot live without bread, but neither can he live on nothing but bread. He is a strange mixture of dust and divinity, of impulse and imagination, and any attempt to educate him must take both sides of his nature into full account. The more scientific training he has, the more he needs the complementary cultivation of his heart and spirit. The more power science miraculously places in his hands, the more he needs a sense of moral values to guide him in the use of that power. It takes more than engineering skill to build a good bridge; it takes also the moral determination that the bridge be safe, and the artistic desire that it be beautiful.

It is this sense of man in his wholeness that has moved the President and Corporation of the Institute to go forward with these buildings. The buildings in themselves are not important, save as they make possible a fuller and richer experience for the men who come here to study.

The use of the buildings is a matter of great interest to those who are closely associated with the Institute. The use of the auditorium is more or less self-explanatory, but the chapel is different. As I understand it, the officers of the Institute have no pre-

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THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Election Returns

On April 25, when ballots closed for the election of officers of the M.I.T. Alumni Association, 3,904 members of the Association had availed themselves of the opportunity to elect Dwight C. Arnold, '27, as president of the Association for the year beginning July 1, 1955. John J. Wilson, '29, was elected vice-president for a two-year term, and Chenery Salmon, '26, and D. Reid Weedon, Jr., '41, were both elected to serve on the Executive Committee for two-year terms.

Alumni term members, to serve on the M.I.T. Corporation for the next five years, are Max L. Waterman, '13, Fred C. Koch, '22, and Hugh S. Ferguson, '23 – currently president of the Association.

Alumni elected to serve on the National Nominating Committee for the next three years are as follows: *District 1* – Horatio L. Bond, '23; *District 2* – Robert C. Erb, '17; *District 4* – Harold Chestnut, '39; and *District 5* – Clayton D. Grover, '22.

Elected to serve on the Alumni Council as representatives of their classes are: Godfrey L. Cabot, '81; Arthur T. Chase, '86 (deceased – as this issue goes to press); Harry H. Young, '91; John A. Rockwell, '96; Willard W. Dow, '01; Edward B. Rowe, '06; Orville B. Denison, '11; Joseph W. Barker, '16; Henry R. Kurth, '21; Chenery Salmon, '26; Gilbert M. Roddy, '31; William W. Garth, Jr., '36; D. Reid Weedon, Jr., '41; Theodore P. Heuchling, 2–46; Donald A. Hurter 6–46; and Robert S. Gooch, '51.

Fabian Bachrach

Dwight C. Arnold, '27, XV
President-Elect of the Alumni Association M.I.T.

Lincoln Laboratory Head

The appointment of Marshall G. Holloway as director of the Lincoln Laboratory was announced in mid-April by James R. Killian, Jr., '26, President of the Institute. The Lincoln Laboratory, which is concerned with problems of continental defense, is managed by M.I.T. for the Army, Navy, and Air Force.

Dr. Holloway comes to M.I.T. from the Los Alamos Scientific Laboratory in Los Alamos, N.M., where he has served since 1943 and has been actively engaged in nuclear scientific problems, including the development of atomic weapons to which he personally contributed very substantially. He has recently served in Washington on a very important advisory committee for the Director of Defense Mobilization. Dr. Holloway assumed his new duties in May, succeeding Albert G. Hill, who asked to be relieved of the responsibilities of director of the Lincoln Laboratory to permit him to return to his position as a professor in the Department of Physics at the Institute.

Dr. Holloway, a native of Oklahoma, was graduated in 1933 from the University of Florida. He took his degree of master of science in 1935 and the degree of doctor of philosophy in physics in 1936 at Cornell University. He taught at the University of Florida and at Cornell, and served in the Purdue Research Foundation from which he was called in 1943 to go with the "Manhattan District" to Los Alamos.

Acting Heads

Professor Edwin R. Gilliland, '33, has been appointed acting head of the Department of Chemical Engineering to serve during the absence of Professor Walter G. Whitman, '17, who has been appointed secretary general of the United Nations World Conference on Peaceful Uses of the Atom.

Professor James Holt, '19, Executive Officer of the Department of Mechanical Engineering, will be acting head of his Department during the absence of Professor Jacob P. Den Hartog, who is giving a series of lectures at the University of Tokyo.

M.I.T. Photos

Erwin H. Schell, '12
Professor of Industrial Management

Ralph C. Young, '29
Associate Professor of Inorganic Chemistry

George A. Znamensky
Assistant Professor of Russian

Faculty Retirements

THREE long-term Faculty members will retire from the Institute this summer. They are: Erwin H. Schell, '12, Professor of Industrial Management and Head of the Course in Business and Engineering Administration; Ralph C. Young, '29, Associate Professor of Inorganic Chemistry in the Department of Chemistry; and George A. Znamensky, Assistant Professor of Russian in the Department of Modern Languages. All will retire with the title of Professor Emeritus and will continue to serve as lecturers in their special fields.

Professor Schell, who is widely known for his contributions to the study of business and industrial management, was born in Kalamazoo, Mich., in 1889, and in 1912 received the degree of bachelor of science in mechanical engineering at M.I.T. Five years later, after successive positions as operations engineer, industrial engineer, labor manager, and company treasurer, he was appointed a part-time assistant professor of business management at M.I.T.

Named associate professor in 1926 and full professor in 1929, Professor Schell also served from 1917–1928 as industrial engineer, executive assistant, and management counsel for the American International Shipbuilding Corporation, and as part-time assistant professor at the Harvard Graduate School of Business Administration. M.I.T. appointed him acting department head in 1930, and department head in 1931.

Professor Schell, who served as consultant on administration to the Department of State in 1944, is a member of the Corporation of Simmons College and a director of Keystone Custodian Funds, Inc., and in 1938 was awarded the Gilbreth Medal. He has been an active member and office holder in the American Management Association, National Management Council, Academy of Management, Executives' Club, and Theta Delta Chi Fraternity; and is a member of the American Academy of Arts and Sciences.

Dr. Young, a member of the Institute's staff since 1922, was born in Phoenix, N.Y., in 1889. He was graduated from Syracuse University in 1912 with the degree of bachelor of arts, and received the degrees of master of arts at Syracuse in 1913 and doctor of philosophy at M.I.T. in 1929.

After serving as chemist with the U.S. Department of Agriculture from 1917–1918 and as instructor in chemistry at Syracuse University from 1919–1921, he was appointed instructor in chemistry at M.I.T. Dr. Young was research associate in inorganic chemistry from 1929 until 1934, when he was promoted to assistant professor of chemistry. Since 1940 he has served as associate professor of inorganic chemistry.

Dr. Young is a fellow of the American Academy of Arts and Sciences and a member of the American Chemical Society.

Professor Znamensky was appointed instructor at M.I.T in 1942, and four years later was promoted to assistant professor of Russian. He was born in Novocherkassk, Russia, in 1890, and in 1916 received the degree of bachelor of divinity at the Imperial Theological Academy of Kiev.

Before coming to the United States, where in 1932 he was awarded the degree of master of education at Harvard University, Professor Znamensky was instructor of Russian language and literature and president of the Classical Junior College in Russia from 1916-1920, and Professor of Russian at the Russian Lyceum of Constantinople from 1920–1922. He was a lecturer on Russian at Harvard University in 1934 and from 1942-1951. During World War II, Professor Znamensky was associated with Harvard University and the Army Service Forces' Specialized Training Division as an objective testing examiner and instructor in the Russian language. He is author of *Elementary Scientific Russian Reader* and also of *Conversational Russian.*

Faculty Progress

M.I.T. Photos

Alex Bavelas, '48 **James W. Daily** **Harold W. Fairbairn**

SENIOR posts on the Faculty of the Institute have been announced for seven men who become professors, and for 16 who become associate professors. In addition, 12 have been named assistant professors and eight will become instructors at the Institute, following approval by the Executive Committee of the M.I.T. Corporation. All promotions become effective on July 1.

Members of the Faculty appointed to the rank of full professor are: James W. Daily, Department of Civil Engineering; Henry J. Zimmermann, '42, Department of Electrical Engineering; Harold W. Fairbairn, Department of Geology and Geophysics; Alex Bavelas, '48 (now on leave at the Center for Advanced Study in the Behavioral Sciences at Stanford University), School of Industrial Management; Joseph Kaye, '34, Department of Mechanical Engineering; Carl W. Wagner, Department of Metallurgy; and Herman Feshbach, '42, Department of Physics.

The following have been promoted to the rank of associate professor: Robert L. Halfman, 2–44, and Tao Tzu Li, '38 – both of the Department of Aeronautical Engineering; Richard Filipowski, Department of Architecture; Thomas H. Pigford, '48, Department of Chemical Engineering; Kevin A. Lynch, '47, Department of City Planning; J. Melvin Biggs, '41, Department of Civil Engineering; George P. Shultz, '49, Department of Economics; Richard B. Adler, '43, Department of Electrical Engineering; Samuel A. Goldblith, '40, and John T. R. Nickerson, '32 – both of the Department of Food Technology; Myron J. Gordon, School of Industrial Management; Kenkichi Iwasawa, Department of Mathematics; Stanley Backer, '41, Frank A. McClintock, '42, and Maurice E. Shank, '49 – all of the Department of Mechanical Engineering; and Felix M. H. Villars, Department of Physics.

Members of the staff who will join the Faculty as assistant professors beginning next summer are: Thomas F. McNulty, '49, Department of Architecture; Carl W. Garland, Frederick D. Greene, 2d, Herbert O. House, Norman A. Nelson, and John S. Waugh – all of the Department of Chemistry; Warren G. Bennis, '53, Department of Economics and Social Science; John F. Twigg and Earle H. Watts – both of the Section of Graphics; William D. Stahlman, '48, Department of Humanities; Robert E. Ogilvie, '52, Department of Metallurgy; and John G. King, '50, Department of Physics.

Members of the staff advanced to the rank of instructor include: Joel G. Flaks, Department of Biology; Moise H. Goldstein, Jr., '51, Philip M. Lewis, 2d, '54, Norman H. Meyers '54, Thomas H. Putnam, and Walter C. Schwab, '51 – all of the Department of Electrical Engineering; Stanley E. Charm, '52, Department of Food Technology; and Robert A. Hard, '49, Department of Metallurgy.

Herman Feshbach, '42 **Joseph Kaye, '34** **Carl W. Wagner** **H. J. Zimmermann, '42**

Course XV Honors Professor Schell and Miss Barnard

M.I.T. Photos

Miss Olive Barnard (above, in light dress) was honored at the Course XV luncheon on May 7. (Left) President Killian amuses his audience at the Course XV dinner. Others in the photograph are (from left to right): Professor Schell, Mrs. Killian, Dean Brooks, Mrs. Schell, Dr. Killian, Mrs. Eli Shapiro, and John S. Saloma, 3d, '56.

A CONFERENCE for Alumni of the Course in Business and Engineering Administration was held at the Sloan Building all day on Saturday, May 7. Under the title "New Directions in Education for Management" the threefold purpose of the conference was to: (1) report to Alumni on the emergence of Course XV into the School of Industrial Management; (2) present examples of current research being conducted in the School; and (3) pay tribute to Erwin H. Schell, '12, a beloved and stimulating teacher.

The morning conference session was devoted to a discussion of reports of research in progress, and in the afternoon Professors Douglass V. Brown and Douglas M. McGregor conducted a lively dialogue entitled "Organization Theory: Help or Hindrance?"

At luncheon in the Faculty Club, which was attended by 180 people, Dean E. P. Brooks, '17, spoke on the progress being made by the School of Industrial Management. Tribute was also paid to Miss Olive Barnard, technical assistant, whose ability to recall the names of Course XV students and Alumni is unfailing. As a token of the esteem in which she is held, Roger R. Smith, '26, presented a rocking chair to Miss Barnard.

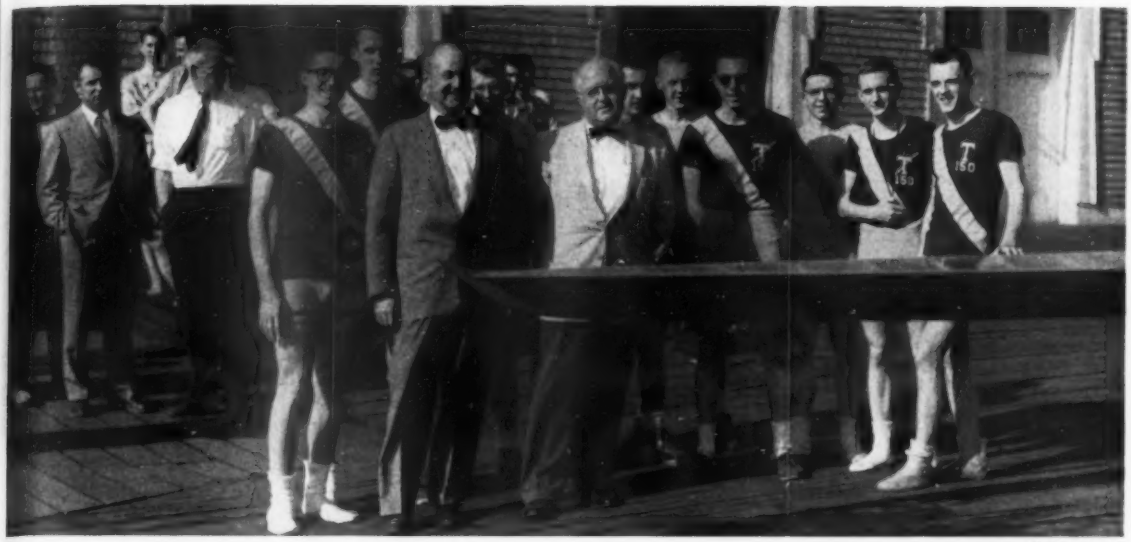
Dean Brooks presided at the dinner, which was also held in the Faculty Club, at which 236 friends were present. James R. Killian, Jr., '26, President of the Institute, commented on the personal relations he had enjoyed with Professor Schell, as a student and as an Institute official. Duncan R. Linsley, '22, paid tribute to Professor Schell in outlining Professor Schell's relations with Technology Alumni. Finally, Professor Schell delivered one of his famous lectures — entitled "The Second Million."

John R. Macomber: 1875-1955

JOHN R. MACOMBER, '97, a life member of the M.I.T. Corporation, a member of its Executive Committee, and chairman of the Finance Committee, died at his Framingham home on May 11. Mr. Macomber was born in Framingham in 1875, attended the Chauncy Hall School, and M.I.T.

He began his business career in 1894 as a messenger for the firm of N. W. Harris and Company, and 17 years later became vice-president. In the following years, as the firm was consolidated with other corporations, he served as president of Harris Forbes and Company, Inc., from 1916–1931; as chairman of the Board of Chase Harris Forbes Corporation from 1930–1933; and as chairman of the Board of the First Boston Corporation from 1934 until his retirement in 1947. He was also a member of the Board of Trustees of the Massachusetts General Hospital. Mr. Macomber was elected a term member of the M.I.T. Corporation in 1926, and a life member in 1931.

Mr. Macomber was a director of several financial and manufacturing firms. A founder of the Metropolitan Opera Association, past president of the Boston Chamber of Commerce, and former chairman of the Y.M.C.A., Mr. Macomber was also active as director and trustee of the Massachusetts Society for the Prevention of Cruelty to Animals, and American Humane Education Society; and as trustee of Tufts College, New England Conservatory of Music, Massachusetts Society of the Prevention of Cruelty to Children, and the National Foundation for Infantile Paralysis.



M.I.T. Photos

Willy

A SLEEK, beautiful new shell was made available to M.I.T. oarsmen at dedication ceremonies at the Tech Boat House on the afternoon of Tuesday, May 3. The new shell is the gift of Arthur A. Nichols, '28, and William H. Nichols, '27 (pictured with M.I.T. oarsmen above). The shell is named after their father, W. H. Nichols, who was especially interested in amateur sports, and in 1893 won the world's quarter-mile bicycle sprint record. The new shell was christened *Willy* by James R. Killian, Jr., '26, President of the Institute.

After placing the new shell on exhibition, President Killian made a brief acceptance address on behalf of the Institute, and christened the new shell *Willy* by breaking a bottle of Charles River water over the nose of the shell – suitably protected against damage by a crowbar. The shell was then slid into the Charles River.

Last year, the Technology crew chalked up remarkable success in winning the Thames Cup, as reported in the July, 1954, issue of The Review.

The Intercollegiate Rowing Association will hold its annual Stewards' Dinner on Friday evening, June 17, at the Hotel Syracuse, Syracuse, N.Y., and there will be races on Saturday afternoon. Coaches of the crews, the officials, and the stewards will be in attendance at this event, which will be open to the public for the first time this year.

Jenaro Olivares G.

Even the imperturbable Beaver Piñata, judging from his expression and the jaunty cap, has caught the happy enthusiasm of the seven guests who attended the "Noche Mexicana" on March 12 at the home of Fernando de la Macorra, '23. The "Noche Mexicana" was the final event of the seventh annual fiesta of the M.I.T. Club of México. Left to right are: Walter J. Beadle, '17, life member of the M.I.T. Corporation; Mrs. Beadle; H. E. Lobdell, '17, Executive Vice-president of the Alumni Association; Mrs. Lobdell; the Beaver Piñata; Mrs. Brooks, E. P. Brooks, '17, Dean of the M.I.T. School of Industrial Management; and Pedro Albin, '47, President of the M.I.T. Club of México.

Walter M. Fife: 1890-1955

WALTER M. FIFE, '21, Associate Professor of Structural Engineering, who for 33 years served on the Faculty of the Department of Civil and Sanitary Engineering at M.I.T., died on Friday evening, April 22, 1955. He was 64 years old. Professor Fife was born in Peterboro, Ontario, Canada, and attended the Peterboro Collegiate Institute and the University of Alberta, where in 1913 he received the degree of bachelor of science. M.I.T. awarded him the degree of master of science in 1922.

Prior to his teaching career, Professor Fife was employed as an instrumentman for the Dominion Land Surveys and as detailer for the Dominion Bridge Company in Winnipeg, Canada. From 1913–1922, apart from three years' service as lieutenant in the Canadian Expeditionary Force, he was an instructor and then assistant professor at the University of Alberta. After completing his graduate studies at M.I.T., Professor Fife joined the Faculty as assistant professor of civil engineering. He was promoted to associate professor in 1928, and associate professor of structural engineering in 1941.

Professor Fife served as exchange professor at Stevens Institute of Technology during 1934–1935, and in 1935 became a naturalized United States citizen. During World War II he worked half time on special war research.

He was an associate in the Engineering Institute of Canada and the American Society of Civil Engineers, and a member of the Boston Society of Civil Engineers and the American Concrete Institute.

Weather and M.I.T. History

THE 310th meeting of the Alumni Council, held at the Faculty Club on April 25, was opened by Hugh S. Ferguson, '23, President of the Alumni Association. After a business session, the Council listened to Professor Hurd C. Willett, of the Department of Meteorology, speak on long-range weather forecasting, and Horace S. Ford, Treasurer Emeritus, speak on progress during the four decades M.I.T. has been in Cambridge.

Under items of business, Donald P. Severance, '38, Secretary, reported that four members of the staff visited eight local clubs since the previous Council meeting on March 28.

Dwight C. Arnold, '27, chairman of the Committee to conduct the First Alumni Officers' Conference, reported that members of the Alumni Council, Class Officers, Club Officers, Honorary Secretaries, and Educational Counselors would be invited to a conference at M.I.T. beginning on Friday, September 9, and continuing through a luncheon on Saturday, September 10. The purpose of the conference will be to bring this group up to date on current developments at M.I.T., to discuss problems they may have regarding student admissions, and to give them an opportunity to become better acquainted with the modern Institute and its students.

Theodore T. Miller, '22, chairman of the Alumni Fund Board, reported that as of the date of reporting, 9,700 Alumni had contributed $354,000 to this year's Alumni Fund.

Samuel C. Prescott, '94, chairman of the Committee on Honorary Members, reported that John J. Rowlands, Director of the M.I.T. News Service since 1925 and an Editorial Associate of The Review for almost an equal length of time, had been nominated as an honorary member of the Alumni Association. This report was accepted by a rising vote and hearty applause.

As chairman of the 1955 Alumni Day Committee, Avery H. Stanton, '25, disclosed final plans for Alumni Day.

Robert S. Williams, '02, Professor Emeritus, presented a resolution on the death of Frederick H. Hunter, '02, which was accepted by a silent rising vote. Mr. Hunter had been an active member of the Council for many years.

In the informal portion of the meeting, Professor Willett opened his discussion of long-range weather forecasting by describing briefly the basis for forecasting of day-to-day weather sequences one to four days in advance. Next came a description of extended forecasting.

Professor Willett told how current long-range weather forecasting now depends on following three types of climatic patterns which are basically different in character. Two of these are zonal patterns spinning with the axis of the earth; the third is a pattern of climatic stress, having strong cellular structure with north-south movement.

He discussed the partial failure of forecasts of last winter's weather. He forecast that this would be a particularly hot, dry summer farther south in this country but that the northern part of the United States this summer would have fairly normal weather and temperatures.

The final speaker was Mr. Ford, senior honorary member of the Alumni Association, whose topic was "Forty Years on the Cambridge Side." His first remarks were directed toward the following outstanding "firsts" and their timing:

Establishment of the Alumni Association	1875
Organization of Class Secretaries	1896
Establishment of The Technology Review	1899
The beginning of M.I.T. Clubs, 8 prior to	1900
Addition of 15 Alumni Members on the Corporation	1903
Establishment of the Alumni Council	1909
Beginning of Honorary Secretaries Organization	1931
The start of the Alumni Fund Board	1940
The beginning of the Educational Council	1952

Next he reviewed the improved and expanded dormitory facilities and the tremendous strides that have taken place in building medical, athletic, and recreational facilities.

Following a short résumé of the buildings added to the original Cambridge campus, Mr. Ford closed with two thoughts: First, M.I.T.'s progress has come in surging waves. He illustrated this by reference to the principal advances in the times of Institute Presidents Walker, Maclaurin, Compton, and now Killian; Second, there has been a matter of very fortunate timing. The Institute had just moved to its Cambridge site in time for World War I and its immediate postwar period. Through Dr. Compton's leadership the Institute was scientifically ready when World War II enveloped this country.

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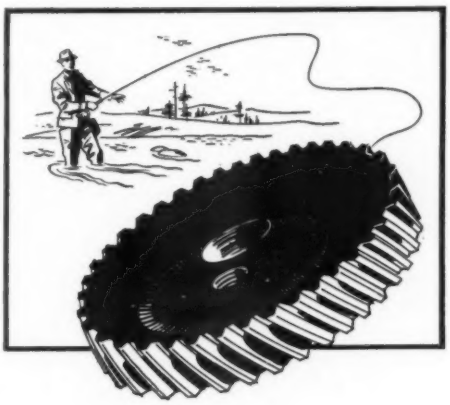

This brass is widely and successfully used in gears for clocks, meters, and similar instruments. However, experience proved that a fishing reel, which is operated at various speeds and loads, presents a quite different service. Revere was asked to suggest a metal that would be more suitable in this application.

The Technical Advisory Service at once reported that either naval brass or aluminum silicon bronze would last longer. However, in order to determine the relative merits of the two, the Revere Research Department was asked to make tests. Gears of both metals were installed in reels, and a motor-driven machine was rigged to provide an accelerated wear test. Each gear was run at 430 r.p.m. and at 100 r.p.m., at zero tension on the line, and at 1, 2, 3, and 4 pounds tension. After each run the gears were removed, cleaned, examined, measured and photographed. The reels were then reassembled, lubricated, and the next run started.

The results were impressive. After the gears had gone through 186,727 revolutions it was felt unnecessary to proceed further. Both reels were still fully usable. The naval brass was somewhat more worn than the aluminum silicon bronze, however, it certainly was evident that naval brass would be satisfactory. The reel maker was determined to offer the best he knew how to make, and selected the more expensive aluminum silicon bronze. He knows conclusively now that his reels will give long service, enduring satisfaction, and will protect his reputation and help his business grow.

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MAIL RETURNS

(*Continued from page 380*)

FROM MIGUEL C. JUNGER, 2-44:

The lambasting and persiflage Mr. Tichenor accorded Dr. Pusey and Dr. Hutchins, for advocating that college students be exposed to broad general culture whether or not they intend to devote themselves to the sciences, is unexpected and rather entertaining. After all, there are more Nobel prize-winning scientists on the faculty of Harvard than on that of any of our technological schools, and the role played by the University of Chicago during World War II in developing the atom bomb is unparalleled; the Pusey-Hutchins approach therefore does not seem to have too nefarious an effect on science. It is also notable that many of the greatest scientists and engineers have had predominantly classical educations; a scientist such as Professor Schroedinger has written an authoritative work on ancient Greek thought and Dr. Oppenheimer is a Sanskrit scholar.

Mr. Tichenor's statement that "History . . . is a satisfying pursuit for timid men . . ." strikes an amusing note if one considers that some of the most courageous statesmen of our times, such as Churchill, Duff Cooper, and Herriot have contributed classical historical works on Marlborough, Talleyrand, and the French Revolution, respectively.

The quotation of the Einstein letter to *The Reporter* amounts to an actual distortion of the facts, as the letter was meant as a protest against the ". . . badgering to which scientists today are subject . . ." by witch-hunting politicians, and not, as implied by Mr. Tichenor, at the hands of humanists and educators.

Mr. Tichenor's thesis amounts to removing scientists and engineers from the professional, literate classes of society and turning them into glorified mechanics produced in staggering numbers; such a procedure would inevitably lead (as it is beginning to in the Soviet Union) to a technocracy à la Orwell. This is indeed a poor defense against the Russian threat which weighs upon us. Attila knocking at the gate is an unpleasant reality, but it should not make us forget the lesson of the old proverb drawn from the wide experience of the Romans in such matters, that the barbarians within the city walls are no less dangerous than those without.

There may be an argument for publishing a controversial article; however, it would certainly have been more tactful if you had used a more conditional phrase in your own introductory editorial reference than ". . . the plea that there should be more engineers of youthful years preparing for the next World War."

In recent years, the Institute has steadily expanded its facilities for the teaching of the humanities. It is thus pursuing a policy in agreement with the Pusey-Hutchins philosophy: It strives to turn out engineers and scientists of broad general culture, fully conscious of the meaning and traditions of our Western civilization. In maintaining this course, our school is, once again, furthering our national interests.

Cambridge 39, Mass.

(*Continued on page 416*)

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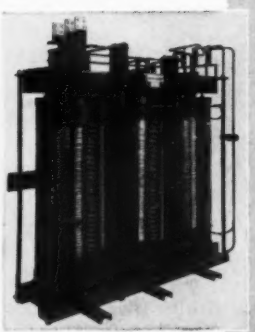

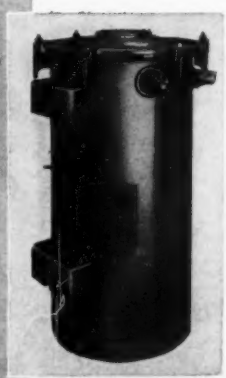

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MAIL RETURNS

(*Continued from page 414*)

FROM EUGENE B. SKOLNIKOFF, '49:

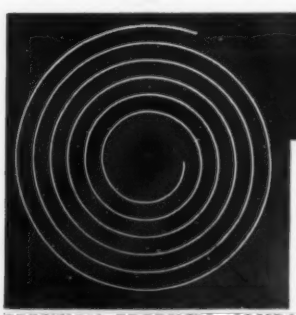
I have read this article with considerable interest, but corresponding dismay. As regards statements of fact, Mr. Tichenor is highly misleading, though not actually incorrect, in stating that the number of engineering graduates has fallen from a high of 50,000 in 1950 to 20,000 last June. What he ignores is the fact that starting in 1955 this number will once again be rising and will continue to rise at an unprecedented and disturbing (in view of the classroom and teaching staff available) rate. Mr. Tichenor forgets that the drop from 1950 to 1954 was primarily due to the end of the extra veteran registration and to the forecasts in 1949 and 1950 that engineers were going to be in great oversupply. This tragically incorrect forecast (in the light of subsequent events) caused many students to shun engineering.

But this is a trivial comment in the light of Mr. Tichenor's astounding statements regarding the value of humanities in an engineering curriculum (or the value of humanities generally). Does Mr. Tichenor really ask us to produce a class of technicians (formerly called engineers) who know nothing further than their formulas and are interested in nothing further? I suspect such a class could turn out some very interesting gadgets and even a bombsight or a bridge or two. But, if we want to talk in terms of national survival as Mr. Tichenor does, I maintain we would be in serious difficulties without a body of engineers and scientists capable of thinking in bold and imaginative terms and capable of understanding how their developments fit into our society and our economy.

If I may take the same quotation used by Mr. Tichenor: Dean S. C. Hollister of Cornell said, "Many persons fail to realize the impact that science, engineering and technology have had in our national life and world affairs." I'm afraid that I draw quite an opposite interpretation from that quotation; surely with this situation, it is imperative that we educate our engineers and scientists so that they *will* understand the impact of technology on our society and can be of significant help in planning for and coping with the rapid changes.

To take a different tack. Even if there were no argument that it is essential for our own survival in a technological sense to give engineers and scientists a broad background, there would remain the argument that we must, as a national policy, educate our youth to be, simply, educated adults. Mr. Tichenor says, "There is no demonstrable proof that they (the humanities) ever made men more democratic." This is not why we believe in

(*Continued on page 418*)



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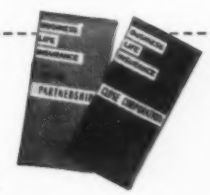

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MAIL RETURNS

(*Continued from page 416*)

education. Surely we are trying to have a nation of individuals who, to the best of their ability, understand their society including both its shortcomings and advantages and understand and are anxious to partake in some of the activities that distinguish a creative and dynamic society. This does not mean that engineering and science are not cultural and creative activities. What it does mean is that they are only part of our society and our heritage. A liberal arts major must know and understand the implications of science; so, too, must a scientist know and understand the environment within which he is working. To consciously eliminate the humanities from technological education is to consciously set out to produce automatons.

I'm afraid that I cannot agree with Mr. Tichenor on the superfluity of the study of humanities either with regard to our military situation or with regard to our general education needs. However, one point is made that does bear repeating and, in fact, demands more emphasis. That is, that our secondary schools should assume more of the burden of education.

Mr. Tichenor's article was most stimulating, and though I find it impossible to agree with any of its major arguments, I compliment the Editor on his including such a controversial subject. I can't help but feel that Mr. Tichenor misses the whole point of a "liberal" education, but I do believe it worthwhile to express a point of view that isn't often heard around institutions like M.I.T. at this time.

Cambridge 39, Mass.

From Julian J. Bussgang, '51:

The author's sarcastic remarks about Harvard and his biting attack on Dr. Hutchins are well below the usual standards of The Review.

The Editor claims the author's contention to be "that an education in science and engineering can be just as cultural as one in liberal arts. . . ." This must refer to some other article for Mr. Tichenor is nowhere concerned about what an education in science and engineering can be. Apart from some disconnected remarks about the "rejuvenation of our educational system," Mr. Tichenor devotes his energy to telling us that we do not need humanists, because the Soviet Union is turning out more engineers than we do.

Let us examine very briefly the construction of this article. The major part of the article consists of a listing of

(*Continued on page 420*)

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MAIL RETURNS

(*Continued from page 418*)

Mr. Tichenor's five reasons for recent decline in the ratio of graduates with engineering degrees to those with arts degrees. These reasons are (in his own order): (1) the present fad among educators; (2) scientist's aversion toward products his knowledge makes possible; (3) average man's escapism into timelessness of the humanists; (4) propaganda of the liberal arts crusaders; (5) Dr. Hutchins. Following a discussion of these five *reasons* the article disintegrates into shallow thrusts in sundry directions. Without debating the documentation under these headings, much of which appears impertinent, one need only examine the five points above to estimate how Mr. Tichenor approaches his subject.

In concluding, I wish to emphasize that there are many scientists and engineers who agree with Dr. Hutchins that the Great Conversation should be continued; the interruption was unworthy of The Review.

Cambridge 39, Mass.

FROM ROY G. SALTMAN (Graduate Student, Elec. Eng.):

The controversy which this article has aroused indicates that people are thinking about the great dichotomy of thought that confronts us concerning "freedom" versus "security."

To summarize my opinions, I would like to recall the statement of a famous religious man (whose name I cannot remember) who was asked what he would do if told that he would die the next day. The man replied that he would live the last day just like any other day. The comparison I draw from this is the following: that every day the U.S.A. faces danger, and no day is different from any other day. If the basic liberties granted us were enough to protect us from enemies for 180 years, they are good enough to protect us today, without the addition of restrictive laws. Of course technology has advanced since 1776, but no law ever protected anyone against technology, but rather against human nature. To keep our freedom, we must study not only technology, but human nature—through philosophy, history, sociology, economics, music, art, and everything else.

It is interesting to note that I and other "liberals" represent a truly conservative viewpoint in championing the above opinion. It is the ultra-security-conscious people who are the real radicals in this dispute.

Cambridge 39, Mass.

(*Continued on page 422*)

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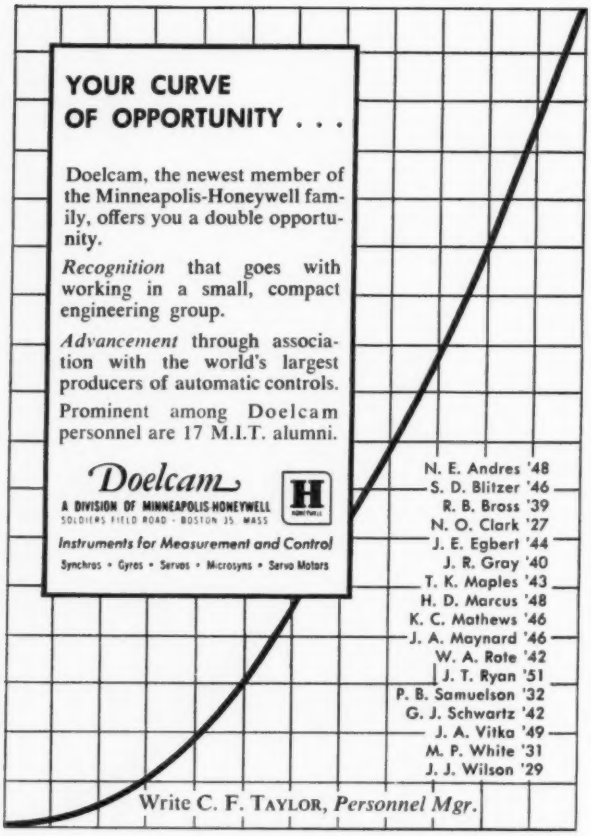
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MAIL RETURNS

(*Continued from page 420*)

FROM DR. OWEN S. GIBBS:

I would like to meet George Tichenor, for like myself he has passed an interesting life industriously picking up all kinds of treasures. Probably his first collection was glittering and lustrous, suggesting the fantastic possibilities of a Utopian Arabian Nights – some of which are, myogenically at least, especially attractive.

As experience grew, these ideas of earthly heavens – when all was aseptically controlled by electronic robots, and on the streets abounded nymphs of unbelievable beauty clad in wondrous raiments of "sheer" ecstasy – began to be replaced by more substantial and attainable wishes of relatively good plumbing: perhaps yet tainted with idealistic visions that packing food need not completely destroy its own natural flavor.

Slowly, and probably imperceptibly, experience grew and matured until finally we both turned the last part of the spiral and looked down on our own pathway; seeing again the same sights, through the same eyes, but equipped with a different analyzer.

Everything was there just as before; everything was interesting and valuable; but the relative importance had changed, and I in my own profession had learned anew, exactly as George has in his, that it is wise to try and keep the patient alive until you have time to cure him.

Philadelphia, Pa.

Author Answers

FROM GEORGE TICHENOR:

The Technology Review and its editor, B. Dudley, are to be congratulated on their public-spirited willingness to provide a forum for a subject which was certain to be as controversial as it is important.

I must accept reproof for the vehemence of my language, which one writer found vindictive and another "needlessly insulting." In extenuation, I would suggest that it is difficult to be moderate in the face of so much complacency about Russia outstripping us in technological man power at an accelerated rate. The too-frequent attitude seems to be: "So Attila is knocking at the door? . . . Hmm, well, be that as it may. . . ." Or as Mr. Smith says: "Why the author . . . should wring his hands in woe over the fate of his precious skin at the hands of the Russian engineers is something I cannot fathom."

There is a thin suggestion running through several letters that counterpreparedness is equivalent to warmongering and that the cultivation of spiritual values is enough. I don't wish to sidetrack into fields of theology, but I find the example of the Puritans very appealing: they went to church with their guns and kept their powder dry. I seem to be more interested in precautionary measures to preserve our cultural heritage (and "precious skin") than critics who accuse me of lack of interest in same.

I do not share the pessimism of some educators that engineers unsweetened by the liberal arts will develop into a species of tree-swinging creatures with a banana in one hand and a bombsight in the other. And I wish there was not this insistent dichotomy that we are Cultured *or* "a class of technicians . . . technologists, totally ignorant of anything else. . . ." I do not believe that deemphasis on the humanities in technical schools will remove "scientists and engineers from the professional, lit-

(*Concluded on page 424*)

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MAIL RETURNS

(*Concluded from page 422*)

erate classes of society" and turn them "into glorified mechanics produced in staggering numbers. . . ."

The point of my argument was that technical schools are taking up the slack of liberal arts subjects neglected by secondary schools, as Mr. Skolnikoff confirms. I also resent on behalf of the younger generation the forceful intrusion of the humanities into a crowded curriculum, at the expense of equally creative and cultural technical subjects forced out! I am in favor of such training as would make engineers and scientists broadly educated, in economics, law, history, and the liberal arts. But I think that this should be in addition to their training in engineering and science, not as a substitute for it. Let it be as postgraduate work or lifetime leisure study. I hold no brief for the narrow, one-sided technician. But if he is a good technician, it seems to me he fills a more useful place in society than the nincompoop who has managed to amass such a smattering of ignorance in the humanities as to develop into an all-around dabbler in superficiality. (There I go, getting vehement again.)

The letter of Mr. Bussgang, like some of the others, deplores my approach without grappling with the issues. Does it recognize the Soviet challenge in technological man power and suggest a means for meeting it? No. Does it question my belief that humanities thrust into a curriculum, thrust valuable engineering subjects out? No. It worries about my analysis of reasons for a situation. Since the article was written, a bill (H.R. 2179) has been introduced into Congress "to increase the supply of scientific and technical manpower . . ." and educators have met on the same problem, but present critics are more concerned with my lapses with Emily Post. Mr. Bussgang deplores my "biting attack on Dr. Hutchins." But note that no one in this symposium deplores by so much as a peep Dr. Hutchins' bites at technical training!

I don't know what it will take to make engineers lift up their heads with pride in their art. I remember some years ago attending a demonstration of sand painting by a Navajo Indian who squatted on the floor of the Museum of Modern Art. The crowd, mostly ladies, oh'd and ah'd at the stick figures he was creating. This was the real stuff for those in the know. At our backs was a view through the window of the knife-like blade of a building in Radio City. That, to me, is beauty and culture, along with Salk vaccine and all the other life-comforting devices, which, as Dr. Gibbs suggests, will help us "keep the patient alive until you have time to cure him." But I am afraid that technology will continue to be despised until the archaeologists dig us up and pay tribute to a mighty people. The liberal arts crowd has the Indian sign on you.

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TREND OF AFFAIRS

(*Continued from page 390*)

The element of joyous anticipation, to which Dean Burchard alluded in announcing the Fortnight Festival was evident as the M.I.T. Symphony Orchestra, Glee Club, and Choral Society performed the "Canticle of Freedom" by Aaron Copland. Mr. Copland's composition is modern, festive, and joyful, and was admirably composed for the occasion. The fact that it was commissioned by an educational institution long noted for progress in science and engineering gives evidence that those pursuing the technical professions need not be – and in fact are not – blind to the emotional and intellectual appeal of the arts.

Principal speaker of the dedication was E. N. van Kleffens, President of last year's United Nations General Assembly. Dr. van Kleffens emphasized the need for faith and belief beyond that which science alone can provide. He admonished his listeners to ascertain the "divine and human laws which set a boundary to what man may do with his scientific discoveries." From the sacred places where these rules come to the surface, he urged them to look to religion, to law, to philosophy. This scholarly address, admirably suited to the occasion, is reproduced in full on page 403 of this issue of The Review.

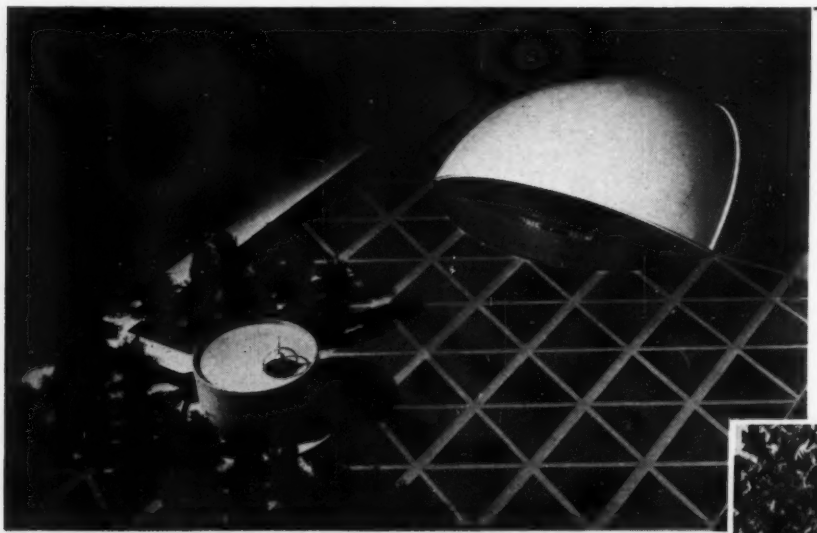
In delivering the affirmation address, as a representative of the M.I.T. Corporation, Theodore P. Ferris, Rector of Trinity Church, spoke primarily of the role the new chapel will play in serving the needs of Technology students of all religions. "The great revival will come," said Dr. Ferris, "not when something old is rediscovered, but when something new is discovered for the first time. What more likely place for this to happen than in the small chapel on the campus of M.I.T.?" The complete text of Dr. Ferris' address appears on page 406 of this issue of The Review.

Acceptance of Auditorium and Chapel

In accepting the Kresge Auditorium and Chapel on behalf of the Institute, President Killian paid tribute to the members of the Kresge Foundation – Stanley S. Kresge, Howard C. Baldwin, and Amos F. Gregory, in addition to Sebastian S. Kresge – who played the major role in making available the unconventional buildings. President Killian's able address is reported in full on page 401 of this issue of The Review, so that further comment need not be included here. It may be appropriate, however, to recall Dr. Killian's views of the Institute's religious program as given in his report to the M.I.T. Corporation in October, 1954. Said President Killian:

. . . While partaking of the Judeo-Christian traditions and postulates of American society, a private secular institution must at the same time embrace our tradition of religious tolerance by being equally hospitable to all genuine religions, creeds and personal convictions. Its institutional policy must be one of equal opportunity for all beliefs and outlooks, which means not only that it must express no bias toward any creed but also that it must not exhibit any bias toward religion itself. A private secular

(*Concluded on page 428*)



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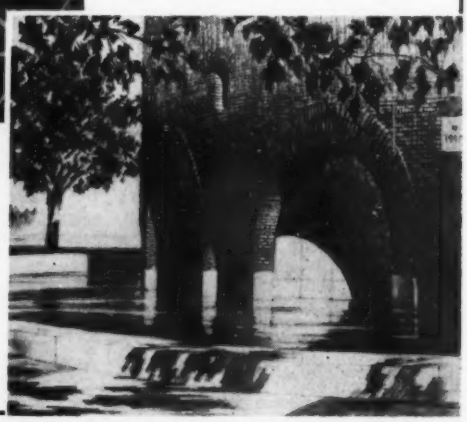

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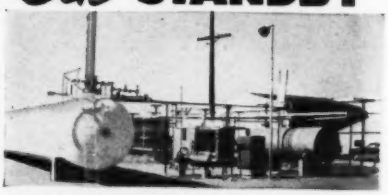

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TREND OF AFFAIRS

(*Concluded from page 426*)

institution should be hospitable to religion and to the pursuit of spiritual matters by men of all creeds and differing outlooks, but it should not permit itself to be used to advocate or deny any theological doctrine or any philosophical position toward religion. Our responsibility is to provide opportunity, in a manner wholly elective, for the development of spiritual maturity and the exercise of spiritual interests.

The small devotional chapel which we are building at M.I.T. has been conceived and will be used in accord with these principles. It will be in the completest sense nonsectarian, equally available to individuals and groups of all faiths. Its purpose is two-fold:

First, to stand as a symbol of the place of the spirit in the life of the mind and as a physical statement of the fact that M.I.T. has a right and a responsibility to deal with ideals as well as ideas and to be concerned with the search for virtue while we become proficient in the search for things.

Second, to provide ready opportunity for students and other members of our community to worship as they choose, to have on campus a building, beautiful and evocative of reverence and meditation, where those who wish may enter and worship in their fashion.

This two-fold purpose of course includes the provision of opportunities for the separate faiths and groups to use the chapel each in their own way so long as this does not require special privilege. . . .

The chapel is in this sense but a part of a broader spiritual program long evolving at the Institute. The future direction and method of this program must rest upon community acceptance and desire, and coordinate with our developing program in the humanities and social studies. It should grow naturally out of the spiritual values which are inherent in our institution. We should remember that M.I.T. was founded by unselfish men for altruistic purposes and that it has always been an implicit expression of high moral purposes and standards. "The flame of Christian ethics," to use Sir Winston Churchill's phrase, has lighted the institution throughout its history and given it direction and spirit. As a consequence we have a community held together by a humane and tolerant spirit of mediation, reconciliation and reverence for the individual, a community governed by a passion for truth, freedom of inquiry and a preoccupation with ideal aims. We have a community generous in its opportunities to live and let live; a community where men of many faiths and backgrounds are free to interact on each other; a community committed to the ideals of professional service, of ministering to the public, of advancing learning and creating beauty.

These are the spiritual bonds that hold together our society of scholars. Our developing spiritual program, to be valid, must embrace them, exalt them and be consonant with the environment they have created.

President Killian's words express a faith and a conviction. The Kresge Auditorium and Chapel provide new means and instrumentalities by which this faith and conviction may be expressed and brought to full fruition. No one who attended the dedication ceremonies on May 8 could fail to have observed that the ceremonies themselves gave the first full, wholehearted expression to that broader education in which science and religion, combined, contribute to the education of the whole man.

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STRUCTURES

(*Continued from page 400*)

light on its wood and metal pipes make a rich complement to the intricate metal screen behind the large marble pedestal.

On the lower floor of the chapel is the robing room, storage rooms, wash rooms, and maintenance and service rooms. A small elevator is provided to move religious articles from the robing room to the marble pedestal.

Design and Construction

Architects and engineers alike agree that the design and construction of the Kresge Auditorium and Chapel have required courage and daring on the part of the donors, the architects, and all those connected with the planning and construction. The two new structures are radically different in form and purpose from the main educational buildings of the Institute designed four decades ago by Welles Bosworth, '89.

In contrast to the usual rectangular shapes of most buildings, the auditorium and chapel are built almost entirely in curved forms. Although the curved designs which have been adopted are well suited to the purpose for which the buildings have been dedicated, they have injected a number of unusual – and sometimes very difficult – problems of construction. Curved structures minimize straight lines and right angles for which most building materials are manufactured, and in many cases require forms and materials which are not stocked as standard items. The reinforced concrete spherical dome represents the most obvious need for unconventional construction, but it is by no means the only example calling for special techniques. In a number of instances special fittings and equipment, or special construction techniques were employed. Not all of the unusual features were the result of curved members, however; frequently standard items readily available from stock proved to be inadequate for the purpose or were found to be out of harmony with the artistic motif being sought. Like the auditorium, the chapel, too, requires more than ordinary attention, with each brick different from every other one, and carefully fitted into place by hand.

Participants

Architects for the Kresge Auditorium and Chapel were Eero Saarinen and Associates; associate architects were Anderson and Beckwith. Ammann and Whitney were the structural engineers, Hyde and Bobbio were mechanical engineers, and George A. Fuller Company was the general contractor. Bolt, Beranek, and Newman, Inc., were acoustical consultants, and Stanley McCandless was consultant for the theater and lighting. Walter Holtkamp constructed the organ, and the gilt chapel screen was designed by Harry Bertoia. The spire and bell, to be

(*Concluded on page 432*)

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STRUCTURES

(*Concluded from page 430*)

placed above the chapel, were both designed by Theodore J. Roszak.

Finally, no record in The Review would be complete without mentioning the donors – the Kresge Foundation, established by Sebastian S. Kresge. Without the support of this Foundation, the work of all others would have been of no avail; with it, splendid new facilities for the Institute's students and Faculty have come into being, and perhaps a new era of college campus construction may have been inaugurated.

THE AFFIRMATION

(*Concluded from page 406*)

conceived notion of how the chapel shall be used and have no intention of superimposing upon it any ecclesiastical pattern or plan. To my mind at least, it is better so. Let the use of the chapel be partly determined by the course of events, and partly by its ability to meet and answer real needs of real people. It must be free to respond to the unpredictable movements of the Spirit.

Obviously we cannot ignore the facts which now prevail in the religious world, the fact that Protestants and Roman Catholics do not worship together, the fact that the Jews have their own ritual and liturgy, the fact that there are other great religions represented here at the Institute which are still further removed in faith and practice. In the use of the chapel, allowance will have to be made for these facts, and provision has been made for all religious groups to use the chapel for their services.

I, for one, hope and pray that we can go far beyond these facts of division. It would be a great disappointment to many of us if the chapel served merely to recapture and reproduce the past. There is a revival of religion taking place right now in our country. For the most part, it consists in the rediscovery of old truths forgotten or neglected, the theology of the Bible, the doctrine and authority of the Church, the healing ministry of Christ. This is all to the good. But the great revival will come, not when something old is rediscovered, but when something new is discovered for the first time. What more likely place for this to happen than in the small chapel on the campus of M.I.T.?

In this place where men are thinking about the universe in contemporary, not mythological terms, where they are constantly in the presence of mystery that exceeds anything that the ordinary man can even guess, and where they hold in their hands the secret to power that can either destroy or redeem us, it is altogether likely that some advance will be made in religion, that new insights into the nature of man and God will be revealed, and that to the religious disciplines of the past will be added the discipline of the atom, sun, and stars.

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DEDICATORY ADDRESS

(*Concluded from page 405*)

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The simple beauty, the simplicity, and the dignity of the new buildings make this a joyful and memorable day in the annals of the Institute. They bring home to us the fact that an establishment for technological studies, intelligently directed in the spirit, let us say, of Karl Compton, can provide an environment for deepening our sense of spiritual values. These ornaments of your campus stand for Truth, for Beauty, for Loyalty toward our fellow men and Unselfishness in the pursuit of learning. The most grateful thanks are due to all those – donors, architects, engineers, consultants, and, last not least, builders of all grades – who, together with the committee on the program of today, have brought us here. They have, all of them, helped to give us these new opportunities for the pursuit of virtue and understanding. May these buildings then bear testimony through many centuries that here worked a generation, one out of many, which, bent on creative work and engaged for its own betterment on enlarging the area of man's domination over the forces of nature, was forever mindful of the divine ordinances whose observance can alone turn technology into the blessing its proper application will bring the human race.

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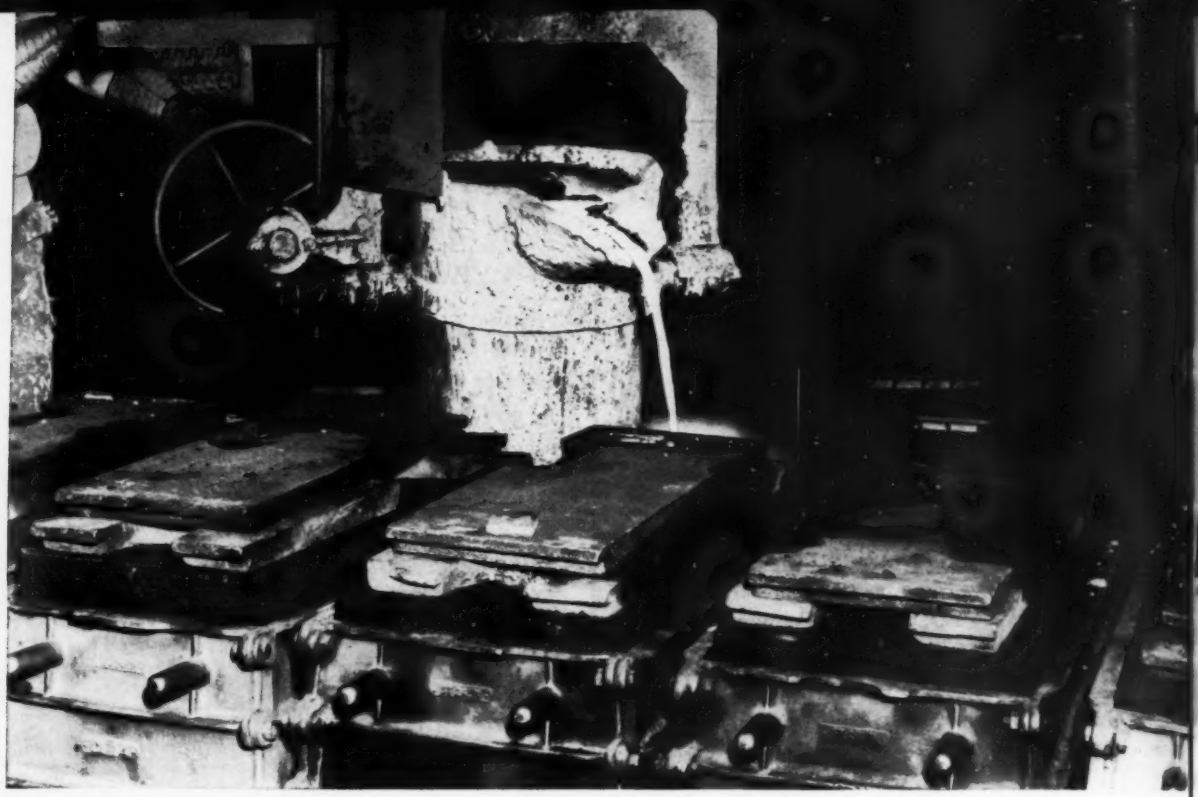

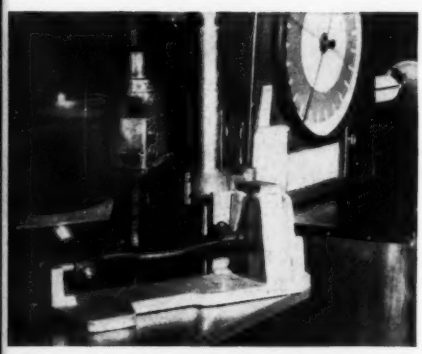

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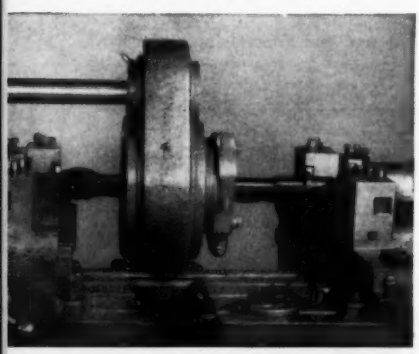

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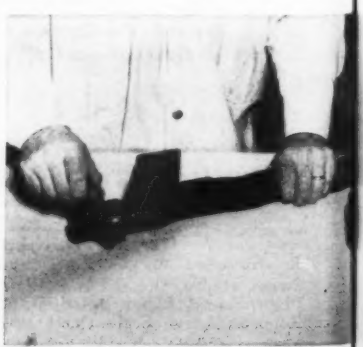

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